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OBSERVATIONS ON DAIRYING AND FARMING IN DENMARK.

By R. Crowe, Exports Superintendent.

Having been interested in Denmark for a great many years, I read everything relating to the country that came my way, and also learned much from conversations with Danish visitors to Australia, and from others who had travelled there.

Of course, I was ambitious to visit Denmark. Naturally, there had been formed in my mind a picture, or rather several pictures, of the rural districts and their industries. Though my visit last year proved that many of these preconceived notions were by no means correct, I must say that I was more than pleased with what I saw, for everything exceeded my expectation.

However, it is with some degree of hesitancy that I venture to say much about Denmark, as my visit was only brief; and when I look at the map of the country and the parts visited, I cannot claim to have seen very much. I can only hope that the places called at were typical, and the impressions gained fairly true. I ask, therefore, that some allowance be made for accidental inaccuracies, and for any crude presentation of facts. For instance, production and exports are quoted in kilos., which always bear the same relation to pounds weight; consequently, my quotations in pounds will be accurate, and true comparisons can be made. On the other hand, money figures quoted can be taken as only approximate, owing to the fluctuation in value from time to time of the kroner in relation to the pound sterling.

Leaving London for Harwich, I went by steamer to Esberg, and took the train to Copenhagen. A feature of the journey is that the sleeping cars are run on to a steamer and taken across the Little Belt to the Island of Funen. After crossing this island the cars are kicked on to another steamer, and thus conveyed across the Great Belt without disturbing the sleeping passengers.

On arrival at Copenhagen—a beautiful and busy city—I called on Mr. Otto Fabricius, and to him I am indebted for mapping out a programme that enabled me to make the very best use of my time during my short stay in Denmark.

Dairying and Dairying Methods.

My first trip was to see a Dairy Research Station, established by the Government within the last few years. On the way, the first place of interest passed was the King's Palace, and a few miles further on we approached what I took to be elaborate University buildings. The place was partially surrounded by a small park, gardens nicely laid out, and a pond, with ducks and game swimming about on it. The architectural embellishments on the huge building rivalled Ormond College here, or any other University buildings I have seen in Australia.

We passed through a stone arch-way, which extended the buildings over the road, and emerged into a little village. In a bay of the huge buildings there was a nicely laid-out garden, with lawn, flower beds, and a beautifully kept gravelled drive up to the main door-way.

Upon asking the chauffeur what place it was, he replied that it was such a company's factory, naming a factory where live stock foods are stored and prepared for dairymen for feeding cows, pigs, and poultry. Perhaps I ought to state here that, whilst most of the stock fodder required is grown in the country, a great deal of concentrated cattle food is imported, and prepared to form balanced rations, or to form a balanced ration when fed in certain proportions with other foods grown on the farm.

This factory, I was told, was only one of many such located in different parts of the country.

At the Research Station, butter and cheese are made daily from milk supplied from the neighbouring dairy farms.

There all new dairy appliances and machinery are exhaustively tested and reported upon regarding their efficiency. Troubles and problems encountered at creameries are investigated and solved for the benefit of those engaged in the dairying industry. Needless to say, the best scientists procurable are engaged on these important functions.

I then went to Odense, whence I was taken for a trip through what might be called the garden of Denmark, motoring about 50 miles. On a farm I was shown the best herd, and the best cow in Denmark. The herd consisted of twelve cows, each one an excellent animal. They arrested one's attention from quite a long distance off, and the best cow was worth travelling a long way to see.

On this farm was a very fine aged bull, a young one about a year old, and a few heifer calves. I was told that high prices were offered for these animals by breeders outside Denmark, but that the Government intervened and would not allow them to be taken out of the country. However, a good sale can always be effected amongst local dairymen.

As it was summer time, all the cows were tethered in the paddocks. There are few fences to be seen anywhere. The cows are tied in a row at one side of the pasture, and moved a stage further forward each day.

The length of rope given each cow is calculated to give her ample food for the day. They are watered at intervals by means of a tank and trough on wheels, drawn to the cows. It was a strange sight to see the herds tended in this manner all day long.

When the cows are in the open all day, it is the custom to milk them where they stand. At the time of my visit the number of daily milkings was three. Late in the evening they were led in long strings to their sheds. All live stock are housed during the winter, which lasts for about six months of the year.

The housing accommodation is extensive on every farm, and, of course, fodder has also to be stored. Consequently, a farm house, with its out-buildings, makes an imposing sight, especially on large farms. At one farm visited the home was like a squatter's residence, surrounded by lovely gardens. At this place over 70 cows were in their stalls. Suspended behind each stall was a blackboard, with the name of the cow, her annual yields, together with current daily milk records—which were also booked up. Between this cow-shed and the piggery, there was a concreted area about a chain square, ramped from the surface at one side to a depth of 8 or 10 feet at the back, with concrete walls on three sides. In this pit every particle of manure, solid and liquid, from cow-sheds, piggery, stables, &c., was conserved for use on the land.

Pigs on a Danish Farm.

The piggery contained 500 pigs, in pens. The partition between each pen consisted of reinforced concrete, one-piece slabs about 1½ inches thick, and white-washed.

After inspecting all the pigs, I asked to be shown the fat pigs. We went to the man engaged sweeping up, who, on his way, stated that pigs from a couple of pens had been sent away to the Co-operative Bacon Factory two days before. He pointed out two pens that would be ready for the factory four days later. I remarked that the pigs were not fat. Upon my comment being interpreted to him, the reply I got was, "We grow pigs for the production of bacon for the English market." I repeated that they were not fat, and received the same reply. This puzzled me until later in the day I remembered that I was the only member of my family who ate all the fat on the bacon for breakfast; on every other plate there was usually some left.

It is sheer waste to put fat on if it is not wanted; the Danes have closely studied this out, and recognize that a point is reached in the age, weight, and condition of a bacon pig beyond which it is not economical to go. To do so would mean a lower price per pound. They do not give pigs one meal more than can be avoided.

So far, every cow seen was of the Red Danish breed—very like Red Polls in the distance, but not so compact in form. They are on the large side, deep and broad behind, with good shaped and well developed udders and teats, and more loosely built than the Red Polls. Their form approximates that of a typical dairy cow. Later, however, when I was travelling through Jutland to Frederickshaven, almost at the extreme north, it appeared that in some places Friesian dairy cattle predominated.

Once the pig has reached its maximum economic value, it has to go to the bacon factory, and thenceforth the food is used for bringing other pigs up to the same peak standard.

In front, over each pen, was a blackboard showing the weight of the pigs each Monday morning. They are taken out once a week and driven on to a weighbridge in the centre of the building, the weights booked up, and then recorded on the blackboard.

No doubt, particulars are also recorded of the value of food consumed. I was told that accounts are strictly kept in regard to all farming operations, as well as in connexion with the live stock.

At an Agricultural School farm I saw long rolls of plain white paper suspended full length over all the pig pens. The surface on both sides was coated with some substance. Upon asking what it was for I was told it was fly-paper, to save the pigs from annoyance—and was assured that it paid to do so.

Occasionally in Denmark pigs are sprayed with disinfectant to kill the fleas, and the pigs thrive better.

Referring again to feeding, it must not be assumed that it was what we call "store pigs" that were sent to the factory. They were well fed, and hard, with the fat evenly distributed over the whole carcass. All the pigs I saw were black, long in the body, and not so fine in bone or appearance as those of the Berkshire breed.

The live weight aimed at is 170 lb., so as to produce 116 to 124 lb. of bacon when cured—or sides from 58 to 62 lb.

For some years past, there has been an increasing demand for leaner bacon in Australia, and bacon factories here pay a higher price per pound for the right weight and conditioned pigs than for heavier or fatter ones. In Victoria, highest prices per lb. are paid for pigs from 128 to 156 lb. live weight, which produce cured sides of bacon from 45 to 55 lb. each.

A short time back, I was returning from Tasmania in the *Oonah*. There were two big fat pigs in a horse-box on deck, and I have no hesitation in saying that the food and time taken to bring these two pigs on would have returned the grower about double the money if more pigs of the right weight had been reared. In very many instances, pig breeding here has not paid as it should have done, for lack of study and attention to the requirements of the market.

The Danish Creamery.

The first creamery visited was a proprietary concern, at which both butter and cheese were manufactured. The next was a co-operative creamery.

All the Danish creameries are on a smaller scale than many butter factories in Australia, but the buildings are large in proportion to their output. Pasteurizing is adopted to an extreme limit. The milk is pasteurized for cheese-making, and all the skim milk is again pasteurized before being returned to the farms, in order to obviate the possibility of conveying disease germs to the stock. The whey is skimmed, and whey-butter made.

A good deal of skim milk is made into cheese for home consumption, and in all cases the fullest use is made of the milk.

I would not like to say that any creameries I saw were in advance of some of our best factories, except in regard to the pasteurization of skim milk; but, generally, the knowledge and skill of the Danish creamery manager is in advance of that of the average butter factory manager in Australia. This is in consequence of their many dairy schools and colleges; hence, a more uniformly high standard quality of butter is produced. There is a variation in quality, but practically none of it is below first grade.

In certain respects, they have better raw materials to work with.

Many of the dairy farmers had been instructed at the dairy schools.

Milk is delivered instead of cream.

The farms are concentrated, the roads are good, the distances from the creameries are short, and the deliveries are regular.

Given the same advantages, our results in regard to quality would compare more favorably.

The Danish Farmers and Technical Knowledge.

An agricultural school and farm was visited, and the feature that most impressed me was the facilities given for short courses, and the extent to which advantage was taken of them.

There are about 70 High Schools and 20 Agricultural Schools in the country, which is less than one-fifth the area of Victoria. This State is about five and a half times the size of Denmark.

The great difference between agricultural education there and here is that in Denmark only pupils who have actually been engaged in dairying or farming for four years at least are admitted. Hence, nearly 100 per cent. of the pupils go back to farming. They secure practical experience on the farm first, and then technical knowledge regarding their vocation at the Agricultural Schools.

A great proportion of the population is ambitious to learn. They realize that a better living, and happier life, comes from the application of acquired knowledge.

The present facilities in Victoria for securing an education to enable those engaged in the manufacture of dairy products, especially to gain an accurate knowledge of the composition of milk, butter, cheese, &c., and a true interpretation of what is meant by cleanliness, contamination, neutralization, pasteurization, sterilization, &c., are extensive, as we have both a Veterinary College and an Agricultural College at the University.

I am sure that short courses could be arranged if there was a demand evidenced. Butter and cheese factory employees, also young farmers and dairymen, should enlist by the score or hundreds during their slack time each year. I do not know whether they are earning too little money, or, perhaps, too much. It may be that there are too many attractions, such as races, football, and picture shows.

Apparently, there is a general lack of ambition, which is not good for the people or the country. It may be that the climate is largely the cause of the difference in view-point between Denmark and here. In that country there is snow for nearly six months of the year, and races, football, golf, and tennis are out of the question. I saw only one football ground in the country. The people go in more for social life indoors—music, singing, dancing, athletics, &c.

Cereal and Root Crops.

Returning to the farm at the Agricultural School, all the cereals and root crops are as good as could be seen anywhere.

It is not generally known that in Denmark wheat, oats, and barley are grown—the latter two to a considerable extent; but the area devoted to wheat is not large. By thorough cultivation, manuring, selection of seed, &c., heavy yields are secured, as the following comparison shows:—

	Australia.		Denmark.	
	Bushels per Acre.		Bushels per Acre.	
	1919–21.*	1922.	1919–21.*	1922.
Wheat	12·73	11·21	46·37	38·97
Oats	15·78	14·77	37·65	41·77
Barley	19·44	19·13	37·99	43·82

* Statistics for 1919–21 represent the annual average for two years.

The good root crops seen, not only in Denmark, but in every rural district I visited on the Continent—sugar-beet, mangels, and turnips—impressed me most.

Outside Malmo, in Sweden, I saw 70 acres of sugar-beet. There was not a weed in the whole area. I believe that not a single plant had missed, and I got the idea that there was little difference in shape or weight between any one plant and the other millions of plants in the same paddock.

The Marketing of Butter.

Co-operation is adopted by the farmers to a very large extent. One thousand one hundred and sixty-eight creameries are conducted on a co-operative basis, and there are also about 200 proprietary creameries.

These creameries have district associations, and a central organization which exercises control over the quality of butter produced by all creameries using the national brand.

On a stave of the butter kegs the "Lur" brand is impressed. This brand is a representation of the old Viking's trumpet, and is allowed to be used on condition that the quality of the butter is maintained above a fixed standard of quality.

Instead of having inspections made at ports of export, as in Australia, a telegram is sent to the creamery manager to forward a keg of butter by first train. No time is given to prepare a special lot, and the butter is graded and analyzed by the control authorities periodically. Instructors are sent to creameries when necessary.

Although there is no control exercised in connexion with the marketing of the butter, two separate committees are in existence, which meet weekly for the purpose of taking stock, so to speak, of supplies, and of the market.

There is issued what is known as the Danish market quotation for the guidance of sellers as well as buyers. This quotation is recognized

within close limits by all concerned, and it has a steadying effect on the price, although at times the real price may be slightly above or below the official quotation.

All Danish butter does not realize the same price; owing to slight variations in quality, and to other circumstances, some factories, of course, have a more regular clientele than others; but, because of its greater uniformity, more regular prices are obtained than is customary with the product of other countries.

The Secret of the Danish Farmers' Success.

I often heard that the land in Denmark was poor in quality, and certainly a great deal of it is so. It is the industry of the people which makes it prolific, and that, coupled with their thrift and contentment, means prosperity.

There are 109,150 farms under 25 acres; 91,400 between 25 and 150 acres; and 5,300 over 150 acres.

The farmers, on account of their thoroughness in every respect, make both ends meet and a little over, and are happy in consequence. They have many advantages as compared with Australian farmers. Some of these advantages they command through their own efforts, as already referred to—better crops, higher yields from their dairy cows, a more uniformly high standard quality of butter, and greater attention to pig-raising and poultry-keeping. They also put up their finished products in more marketable form, particularly bacon and eggs, and supply the market more regularly the year round than any other country. Consequently, they get the highest prices under every heading. In addition, they are close to the best markets in the world. This last advantage gives them a wonderful lead.

On account of the better average quality, fresher condition (it is only a night's journey by sea to England), and regular supply to the market, Danish butter in past years usually brought about 18s. per cwt. more than Australian. This past season, the disparity in price averaged about 40s. per cwt., partly owing to the abnormal demand in Germany for Danish butter.

This season, Australian butter averaged about 175s. per cwt. on the London market. Freight, and all costs, including selling charges and abnormal exchange, totalled 27s. per cwt.; and, if you take 25s. per cwt. as normal, the net price would come to 150s.; and, if the manufacturing costs, including boxes, rail freight, &c., (about 20s.) be deducted, the producer received about 130s. per cwt.—nearly 1s. 2d. per lb., or 1s. 4½d. per lb. butter-fat.

Taking normal conditions, with Danish butter 18s. per cwt. in advance of Australian, the Danish price would be 193s. per cwt. in England; and, estimating the ocean transit and selling charges at 15s., 178s. is left; and assuming manufacturing costs to be the same as in Australia (20s.), the producer would get 158s., against the Australian 130s., or nearly 22 per cent. more.

For the abnormal season just ended, the Danish dairymen received a price nearly 40 per cent. higher than the Australian net returns.

The Danes have a still further advantage in being able to purchase many of their requirements at a lower cost than in Australia. The

Australian dairyman is obliged to buy many, perhaps most, things at the world's market price, plus the cost of bringing them here, plus the tariff, whether the articles are manufactured in Australia or not.

Danish Dairying v. Australian Dairying.

I am indebted to Mr. N. Kjaergaard Jensen, Professor in Dairying, Royal Agricultural High School, Copenhagen, for a lot of up-to-date statistical matter, which is most useful.

The following table shows the annual average yield of cows in Denmark and Australia for nine years, viz.:—

COMPARISON OF MILK PRODUCTION.

Year.	Denmark. Milk. (lbs.)	Australia. Milk. (lbs.)
1914	5,829	2,870
1915	5,666	2,400
1916	5,716	3,200
1917	5,317	3,330
1918	4,043	2 930
1919	3,655	2,780
1920	4 722	3,140
1921	5,518	3,430
1922	5,622	2,880

The average butter production per cow in Denmark in 1922 was about 250 lb., against the nine-year average for Australia of 134 lb., or 86 per cent. difference.

The Danish figures for nine years are not taken because of the abnormally low yields for 1917 to 1920, when the stoppage of the importation of foodstuffs for cattle towards the end of the war interfered with the dairying industry, and the average yield for 1919 came down to 365½ gallons. The average yield in Victoria in 1918 was 368 gallons. What an object-lesson in feeding!

It appears that the 1,339,357 cows and heifers in Denmark are many more than could be properly maintained on the foodstuffs in that country alone. The value of feed—chiefly concentrated—imported in 1921 was £6,757,308; and manure, £2,291,538. These amounts form very large debits against the butter, cream, milk, cheese, casein, condensed and powdered milk exported that year to the value of nearly £21,000,000.

Adjuncts to Dairying in Denmark.

One cannot help thinking that if milk products alone were relied upon to the same extent as is done in Australia, the Danish dairyman would not be so well off. Although his advantages are many, there is the cost of foodstuffs bought, the labour of growing and conserving fodder, the housing of cattle and food, and labour of feeding, to be taken into account. However, he meets the situation by keeping pigs and poultry.

Bacon and pig products exported in 1921 had a value of £12,475,384; and eggs, £5,703,077; whilst meat, chiefly veal, would bring the total to almost the equivalent for milk products, viz., £21,000,000.

From all these comparisons it might be concluded that, in the vernacular, "We are not in it," and we have no chance of successfully competing. It must be remembered, however, that Denmark has exploited her possibilities almost to the utmost extent, whereas we have hardly started.

I believe that, with proper attention to the improvement in breed and feeding of dairy cows in Australia, as good average yields are possible as in Denmark. There are numerous herds here already giving higher annual yields than the Danish average.

In this *Journal* for March, 1925, particulars are given of the yields of 182 cows, which average for the year 6,775 lb. of milk, estimated, per Babcock test, to contain 318½ lb. of butter-fat—equal to 379 lb. of butter.

From a morning paper of the day of writing (3rd July, 1925), it appears there was an increase of 37 lb. butter-fat per cow effected in the last three years with over 800 cows, through the instrumentality of the Mirboo and District Herd Testing Association.

The cost of butter production in this country could be considerably reduced by increasing the yields, and I believe that butter can be produced at a lower cost per pound in Australia than in Denmark.

The same method of feeding is not recommended. Feed can be grown on the farms to prolong the period of lactation. Each farm and each district should adopt means of doing this in the manner most suitable under their own local conditions.

I had opportunities of comparing the quality of Australian butter with Danish, New Zealand, Argentine, and Siberian, and our best—representing nearly 80 per cent. of the output from Victoria (the proportion from the whole of Australia is somewhat smaller)—is second to none. It is equal to the best Danish or New Zealand, and superior to the others. Our efforts, therefore, should be concentrated in bringing the inferior 20 per cent. up to the same high standard of our best. If this be done, higher prices will be procurable for the whole lot. Under present conditions, our best quality butter suffers in price in consequence of the poorer butter accompanying it on the market. In colloquial language, the good butter has to carry the other on its back.

If more attention be also given to pigs and poultry—both of which go well with dairy farming—the position of those engaged in dairying will be immensely improved.

Conclusion.

The population of Denmark is 3,283,000; one-half is engaged in farming, and one-fourth in manufactures and trade.

As before stated, Victoria is five and a half times the area of Denmark, yet there is exactly the same area in each country cultivated for grain crops. The acreage devoted to hay in Denmark is nearly twice that of Victoria, and 1,162,000 acres of root crops (nearly all sugar-beet), as compared with 2,000 acres of sugar-beet in Victoria.

Dairy products practically represent the whole of the exports of primary products from Denmark. Australia exports wool and wheat, fruit, and meat valued at over £100,000,000, in addition to dairy products. Therefore, the people on the land in Australia, with the exception of those engaged in dairying alone, are generally better off than those in Denmark.

WHEAT GROWING IN THE GOULBURN VALLEY.

By H. A. Mullett, B.Ag.Sc., Senior Inspector of Agriculture.

The following notes were intended to be printed for distribution on the occasion of the running of the Better Farming Train to the Goulburn Valley in March last, but it was found impossible to have them printed in time to enable this to be done.

Special Problems.

The Goulburn Valley has wheat-growing problems peculiarly its own, and no system which has been perfected in any other part of the State is likely to be successfully transplanted in its entirety to the Valley, because, for the most part, the conditions there are different. In that district, for profitable wheat growing, bare fallowing is as essential as it is everywhere in the wheat belt; but in preparing and maintaining the fallow, special regard must be paid to its physical condition. A fundamental characteristic of much of the land is that the subsoils offer some difficulty to penetration by water, while the surface is inclined to run together when beaten down by rain. The result is that rather too much moisture is retained in the fallow during the cold winter months, while in the summer the fallows dry out unduly because they readily become set on the surface. Many are afraid to work up this set surface because it is easily reduced to a fine powder, which on further wetting may run together more than ever, a condition which at seed-time would be destructive to germinating seedlings. Thus, rather than risk any germination troubles later, the fallows are allowed to dry out, a practice which, to a large extent, nullifies their value. But by the exercise of a little more judgment in the choice of implement and in time of working, it is generally possible to maintain the surface mulch of the fallow loose enough to prevent undue loss of moisture, and at the same time little risk of faulty germination would be run.

Another difficulty is that water only percolates slowly through the retentive subsoil, and in June, when the soil is charged with moisture, often less than an inch of rain is sufficient to waterlog the surface, hence the sowing season must be begun early and be restricted in length because of the uncertainty of one being able to "get on" the land later than mid-June, even in an ordinary season. Early sowing leads to the growth of tall, rank crops in favorable years, crops that do not yield as heavy as they look; and it renders weed killing more difficult, because most weeds germinate on the fallows in May and early June, i.e., after the crop is sown. The Goulburn Valley farmer, then, has not the same opportuntiy of germinating and killing weeds on his fallows in the seeding year as the Wimmera farmer, who can sow in July with perfect safety.

For many years very passable crops of wheat have been grown on these soils, and now and then, when the winter was unusually dry and the spring rains regular and bountiful—as last year—bumper crops have been reaped. These latter are sufficient to indicate what the land is capable of when all the conditions are favorable.

The farmer's job is to make those conditions over which he has control as favorable as possible every year, and that is a business which requires a deep understanding of the principles governing the cultivation of land, the growth of the crop, the prevention of disease, and the maintenance of soil fertility.

Bare Fallow Essential.

Scientific fallowing is essential for the successful wheat crop, and when all the Goulburn Valley farmers banish the stubble-grown wheat crop for ever, as some are doing, they will have taken a distinct step forward. It will allow them to shorten the seeding season, and hence seed the crop at a more favorable time; it will enable them to grow cleaner crops, because stubble-growing affords no opportunity for the killing of weeds; and, further, the fallowing may be begun earlier—all important principles of good farming. Certainly some good stubble crops have been grown, but generally at the expense of the fallow crop of the following year, and to the detriment of the fertility of the land.

The earlier the fallow the better—June fallow is better than July, and July than August. Experiments at Rutherglen definitely prove that.

Loamy Soils.

There are, of course, extensive areas of free loams in the Valley, especially to the north. Many of them have not a good clay subsoil, hence they dry out readily. It is probable that they can be worked exactly like the Wimmera soils, save in the matter of late sowing. The fallows, after shallow ploughing, should be well worked, and the object of the cultivation should be to maintain about 2½ inches of loose mulch overlying a firmly-packed seed-bed.

Summer Fallowing.

On the more loamy land, summer fallowing could be practised to advantage. The land may be worked up at any favorable time in February, March, or April, and then sown some fourteen or fifteen months later. Summer fallowing is an excellent method of cleaning the land of weeds, more moisture can be stored in such ground, and more of the soil particles converted into soluble plant food by the action of the sun, wind, rain, frost, &c. It is a convenient practice, because it permits of some of the heaviest work being done at a time of the year which is otherwise slack. At Longerenong College, in the Wimmera, practically the whole of the crop is now grown on summer fallow.

Depth of Ploughing.

For many years, Goulburn Valley farmers were noted for thorough workmanship in ploughing. They insisted on the land being ploughed to at least 4½ to 5 inches deep. Latterly, owing to the successes of the shallower work in the Wimmera, many here are inclined to follow suit. But, on all but free loams, that may be a retrograde step, for careful

tests at Rutherglen, extending over the past ten years, have shown that if 5-inch ploughing can be done, it produces about a bag to the acre more wheat than land ploughed to 3½ inches.

The fallow requires to be kept covered with a nice loose cloddy mulch. After rain this should not be allowed to remain set for long, as a great loss of water by evaporation then occurs, nor should the mulch be worked to too fine a condition. The best rule is to work it after rain as soon as possible with the lightest implement that will do the job. The disc cultivator must be avoided as much as possible, as this chops up the soil too finely. The fallow should be cloddy enough at the beginning of the season to allow for its being somewhat pulverized by repeated cultivation.

The rigid-tined cultivator and the Wimmera scarifier are valuable implements for working up fallows. Where the subsoil is inclined to hold up the water, a fine mulch and the hard-packed seed-bed, so ideal for free-working soils, may be fatal to germination. Wimmera cultivation methods are therefore not likely to be successful on this class of land. Plough 4 or 5 inches deep, and leave the mulch cloddy.

Seeding the Crop.

Once the seeding season definitely breaks, Goulburn Valley wheat-growers find it necessary to crowd on all strength and go ahead. The crop may be fed off if it is too rank. On well worked fallow, fully stored with moisture, it pays to increase the seeding from the usual 60 to 70 lb. of wheat, and later in the season, when germination troubles are likely, the increase in the quantity of seed should be still greater.

The better heart the fallow is in, the more plants it will grow, and the more superphosphate should be added. At least 1 cwt. per acre on well worked fallow will be profitable, and in some districts the quantity might well be increased to 1½ and even 2 cwt. per acre. Superphosphate will not burn off the crop in a dry year—it will help it to mature quicker. When the land is spelled in grass, the extra feed will continue to reflect the effect of the heavy dose of manure.

If the wheat be pickled thoroughly, there need not be one head of ball smut. The correct strengths of pickle are:—Formalin, 1 lb. to 45 gallons of water, with immersion for 3 minutes; bluestone, 1½ lb. to 10 gallons of water, immersion for 3 minutes. Pour the wheat into the pickle, and skim off the smut balls or they may re-infect the wheat. Do not use formalin for dry sowing.

Copper carbonate, the new bunticide, is worth a trial. It should be dusted over the wheat at the rate of 2 oz. per bushel. Powder of standard specifications is required, i.e., it should consist of pure basic copper carbonate, containing 50 to 55 per cent. copper. Ninety per cent. should pass through a 200-mesh sieve, and it should possess a density of not more than 31 lb. per cubic foot. Insist that the powder purchased conforms to these specifications.

A mechanical pickler is required for all but small quantities. Care should be taken that the pickler dusts each grain thoroughly, that the powder is automatically added, and that the machine is reasonably dust-proof, as copper carbonate dust is unpleasant to inhale.

The choice of varieties of wheat sown is important. It is desirable to purchase fresh seed regularly from a seed station where selection is practised. Major, selected Federation, Gallipoli 58, and several of the new crossbreds raised by the Department of Agriculture and by the Dookie College, have given prolific yields in tests in the Goulburn Valley.

Lastly, systematic rotation of crops must be practised if the highest yields are to be secured and maintained. Fallow, wheat, and oats for hay, grain, or grazing is more satisfactory than fallow, wheat, wheat, pasture.

Rotation helps to maintain the fertility of the land, especially where green crops can be fed off to live stock. It prevents outbreaks of disease like take-all and flag rust, and it assists in keeping weeds in check.

What the Department Advocates in the Goulburn Valley.

1. Curtail the stubble wheat crop.

2. Fallow as early as possible. Land ploughed for stubble wheat makes good early fallow.

3. Test summer fallow on loamy soils.

4. Except on loose open soils, plough 4½ to 5 inches deep, provided the soil is deep enough.

5. Sow only improved pedigreed seed wheat. Purchase some regularly from seed stations, then multiply it for bulk use.

6. Sow no more than three varieties. Major, Gallipoli 58, Selected Federation are all good. Nizam is a promising new wheat.

7. On good fallow, use from 65 to 70 lb. of seed; increase to 75 lb. for June sowing.

8. On well-worked fallow, seeded heavily, use at least 1 cwt. of superphosphate. It will not burn off the crop.

9. Pickle the seed carefully. The presence of smut is sure proof of faulty pickling. The correct strengths are as follow:—

Bluestone, 1½ lb. to 10 gallons of water—immersion for three minutes.

Formalin, 1 lb. to 45 gallons of water—immersion for three minutes.

10. Do no use formalin for dry sowing, or pickle wheat with it more than a week before sowing.

11. Test the new copper carbonate process—use 2 oz. per bushel. Buy only standard powder. Use a mechanical pickler. This process gives a quick germination. It is invaluable for late sowing.

12. Grow more oats in rotation with wheat, especially oats for grazing sheep. The fertility of the soil will then be maintained, and take-all and flag smut diseases and weeds held in check.

Do your Part—Nature will do the Rest.

WALPEUP FALLOW COMPETITION, 1925.

Arranged by the Walpeup Branch of the Victorian Farmers' Union.

Report of the Judge, H. A. Mullett, B.Ag.Sc., Senior Inspector of Agriculture.

The history of land settlement in Victoria provides many instances where an apparent desert has been made to blossom like the rose—and there is no finer example than what has been done during the past sixteen years in that tract of Mallee country between Ouyen and Murrayville, lying inside the 14-in. line of rainfall.

The area was originally taken up by sheep and cattle men, but reverses due to drought, vermin, and other difficulties incidental to grazing an almost waterless tract of dense scrub led to the holdings one by one reverting to the Crown. Kow Plains Station, near Cowangie, held out until 1899. Subsequently there was no settlement until 1909. Then came the railway and the public water supply; then the sturdy wheat pioneer, equipped with his Mallee roller and stump-jump implements. Where unorganized sheep pasturing failed wheat farming has triumphed.

There were, of course, many vicissitudes, but few who now contemplate the pleasantly undulating landscape, dotted with well-laid-out farms, can form any conception of the formidable task the settlers faced who had to hack their tracks through the dense scrub before they could pitch their rude tents on the sites of the farms allotted them by the Crown. They had to sink dams, roll and burn the Mallee scrub, sow their wheat, erect buildings and fencing, maintain themselves, and few had more than £200 or £300 of capital. Yet the majority have succeeded, and a new wheat province has been added to the State.

During the early years of settlement the wheat was not grown on scientific lines, nor could they be followed. The settler had to sow repeatedly all the land cleared so that the stubble would carry a fire after harvest, and thus scorch and kill the Mallee shoots. His resources were very limited, his implements primitive and few. The wheat had to take its chance. If the season was good six or seven bags to the acre might be harvested; if a dry season intervened he would be lucky to get his seed back. But the unscientific pioneering methods sufficed to put most of these settlers on their feet, and paved the way for the introduction of less risky practices. Gambling on the seasons was at the time a desperate necessity; the capital at stake, however, was small. But now that the holdings have become so greatly improved, and therefore more valuable, the settler has so much to lose that he is unwise to take any unnecessary risks.

The pioneering days have passed away, and with them the obligation to persist in rough and ready procedure; but on too many farms it still obtains. That, perhaps, is not at all surprising considering that it was by rough methods that so many farmers attained success.

But the stubble cropping and the slipshod fallowing methods cannot be continued much longer. Already the once clean virgin land has become foul and introduced weeds, such as wild mustard (as many as

450 introduced weed species have been identified in and around Walpeup), while diseases like "takeall" and flag smut, which flourish where wheat is grown on neglected fallows, and in the absence of proper rotations containing oats, have made their presence severly felt. Summing up, then, there is no longer a need for pioneering farming systems, and they are rapidly becoming unprofitable. The necessity for a change has been obvious to a number of farmers for some years, and they have altered their methods accordingly, but others have been slow to change.

Judging the Competition, 1925.

It was considerations such as these, coupled with the conviction that some stimulus was necessary if any rapid change was to be brought about, that induced Mr. Glen to denote some handsome trophies for competition for the best fallowed land. There were twelve entries, but two withdrew at the last moment.

The fallows were inspected on 10th and 11th February, and they were so surprisingly good that it was difficult to separate them, especially as the summer rains resulted in all of them being highly charged with moisture. Another difficulty was the variable nature of the soil. Most paddocks contained at least one of the sand ridges typical of this portion of the Mallee, with good flats of red loam in between. On the other hand one or two paddocks, originally plain land, contained little or no sand ridges.

Results.

The outstanding fallow of the competition was that of Mr. R. F. C. Gneil, who was awarded 99 points. No more excellent specimen of fallow has ever come under notice in competition in this State, even in the Wimmera. In his land the exhibitor had everything in his favour, as it is a particularly fine piece of even red loam. The land was, of course, highly charged with moisture. The mulch had been prepared with great skill, it was of a mellow texture with a proper admixture of small clods and fine earth, and was proved to be very regular and of even depth over the whole 100 acres. The seed-bed was regular and firm.

The condition of the fallow was evidence of the employment of the highest technical skill. This fallow received no less than sixteen different cultural operations, viz.: Ploughed 4½ inches in the first week of July, then six strokes of the harrows, each successive one crossing the last, between that time and 10th August. Then followed the spring-toothed cultivator. In September the paddock was spring-toothed three times, in October three times, in November once, January once, and February twice. All operations followed immediately after rain. The condition of the surface was not so fine that it was likely to "blow."

The number of operations is, of course, abnormally high, and many will question whether it would pay; but the 170 acres so treated is the total area Mr. Gneil sows, and the frequent summer rains have repeatedly set the surface down, hence the number of workings.

Mr. W. Eagle, Paingie, was second with 97 points. This was an excellent fallow, though the mulch was on the shallow side; the seed-bed, however, was very well consolidated, though inclined to be a little ridged. The ploughing was done during mid-August to 3½ inches deep,

then a harrowing was given. In September a Wimmera scarifier was put over the field, then the harrows. In November, early, a spring-toothing was given, and in December a stroke with the harrows.

Then follow Mr. A. McKinnon (No. 1 entry) and Mr. W. H. Gibbons, with 96 points each—both excellent fallows. Mr. McKinnon believes in rather deeper fallowing than is usually practised in the Mallee—4 to 5 inches. The paddock was ploughed in July and early August, and harrowed. In September it was spring-toothed, also again in October and November. This fallow was well "sheeped." Mr. Gibbons' fallow lost a few points because the mulch was rather shallow, otherwise it was in good order and very well consolidated below. This paddock is of interest, because it had been summer-fallowed during February and March to 3 inches deep. At the end of June the paddock was harrowed twice, and scarified a little later as rubbish appeared. Then followed a double harrowing, in August a scarifying, then a harrowing, in November a scarifying, and finally a stroke with a spring-toothed cultivator at the end of January.

Mr. G. W. Pattinson's fallow contained no flats. It was ploughed in July to 3½ inches deep and harrowed immediately after. In September, October, and early November three strokes of the spring-tooth were given, followed by another at the end of November, and one in February.

DETAILS OF AWARD.

For Best 100 Acres of Fallowed Land.

Competitor.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points	25	25	25	25	100
R. F. Gneil	25	24	25	25	99
W. Eagle	25	24	25	23	97
A. McKinnon (No. 1) ..	25	22	25	24	96
W. H. Gibbons	25	22	25	24	96
G. W. Pattinson	25	23	25	23	96
A. McKinnon (No. 2.) ..	25	21	25	23	94
Thos. Bell	25	23	25	21	94
A. L. McGregor	25	22	25	21	93
J. E. Maugler	25	22	23	23	93
J. R. C. Black	25	21	20	23	89

Fallowing in the North Mallee.

The primary object of fallowing in a district of light rainfall, such as Walpeup, is to conserve moisture to supplement that which falls in the growing period of the crop. When the fallow is kept well covered with a loose dust mulch by regular tillage after rain up to 4 inches, more rain can be saved as compared with fallow just roughly ploughed and then neglected, and this quantity is sufficient to increase the yield by nearly three bags per acre, so the wisdom of conserving it is apparent.

Moisture escapes rapidly from neglected fallow, but the loss can be arrested by stirring the surface. Wheat prefers a well packed seed-bed, so that deep stirring of the fallow should be carefully avoided. At

Walpeup the mulch of loose soil should not be deeper than a couple of inches.

Working the soil when moist helps to pack the sub-soil down tightly, a condition somewhat difficult of attainment on the sandy rises between the flats. The best method of fallowing these ridges, which form portion of almost every paddock, has become a problem now that they are denuded of their humus by repeated cropping. The high sand hills catch the wind, and the fine sandy soil soon begins to drift if much cultivation is done. A little drift does more good than harm, because when admixture with the flats take place the result is beneficial to the latter.

It is well known that a well ridged surface does not drift so badly as one beaten flat, and this method of arresting drift should be practised to a greater extent. But on some sand hills it would be an unending task to attempt to stop all drift this way. These, then, should be cultivated as little as possible, because they are naturally self-mulching and very retentive of moisture. The suggestion has been made that on such sand ridges oats for fodder should be sown on the fallow, and there is much to recommend it. The oat roots would bind the soil and the tramping by the live stock would tend to pack the surface, while the humus content would be increased. Oats, of course, could not be grown without detriment to the moisture content of the fallow, but the sand hills are usually so well charged with it that the loss may not make a great deal of difference. Some of the sand hills would undoubtedly grow a thin crop of lucerne, and the possibilities of this excellent forage as a soil binder and humus restorer should not be overlooked, though it could be sown only on sand hills in paddocks being spelled in grass for a few years. It is just possible that the addition of gypsum, so abundant at Cowangie, may help to bind those sandy soils.

"Takeall."

This disease has now become very prevalent in the district. It is a fungus which attacks the grain at the seeding stage, thrives unseen in the tissues of the plant until sooner or later the wheat dies, often when quite young, but in good seasons just as the seed is forming. The fungus forms its seeds, and these may often be observed as a black incrustation at the base of the stem. These seeds often escape the fire during the stubble burn, and remain in the soil until some host plant, such as barley grass or wheat, makes its appearance; then the disease gets a fresh start. When a crop is badly affected as good a stubble burn as possible should be obtained, and the land carefully fallowed for oats. "Takeall" does not usually grow on oats, and hence may be starved out. A thin stubble crop for oats is quite useless in checking "takeall." if barley grass, &c., is growing amongst the crop. These plants carry the disease forward.

Farmers fallowing land which has been resting in grass should be especially careful of "takeall." Burn the grass and summer fallow the land if possible; work it well and keep it quite free from the grass. Sow the crop late. More oats should be grown in rotation with wheat. The rotation, fallow, wheat, oats (for grazing) is a fine one. Heavy dressings of superphosphate assist the wheat to fight the "takeall" disease.

MANANGATANG FALLOW COMPETITION, 1924-25.

Report by L. C. Bartels, B.Ag.Sc., Chief Irrigation Field Officer

The Importance of Proper Fallowing.

Inspection of the exhibits in the Manangatang Fallow Competition afforded one an opportunity of seeing the splendid work that is being done by soldier settlers in the conquest of the Mallee. Many of the men in this new district have been on their blocks for only three or four years, and so they have not emerged from that period when the presence of Mallee shoots prevents them from applying proper cultural methods.

Because of the low rainfall in the district too great an emphasis cannot be laid on the importance of thorough cultivation. The conservation of moisture is of the utmost importance, and this can be achieved only by good fallowing and attention to fallows.

Fortunately, there are not wanting exemplars of the best farming practices, and indeed most of the men interviewed during judging seem to be aware of the value of good methods; but still, through stress of circumstances or a lack of appreciation of the principles involved in fallowing, many exhibitors had permitted their fallows to become neglected, with the result that a lot of their work had practically gone for nought. The soil auger told a tale which disappointed many of them, but in every case where the moisture content was low the explanation was to be found in late ploughing, set surfaces, and weed growth.

Mallee farmers must realize that if their wheat farming is to be anything but a wild gamble they must fallow, and fallow well. In districts of higher rainfall the conservation of moisture in fallows is of importance, and it becomes of paramount importance in districts such as Manangatang, where the rainfall is comparatively low.

If the land be in bare fallow, it will absorb the rain which falls, but it is quickly lost again if evaporation, aided by wind and rain, is allowed to go on unchecked, or if weeds are permitted to grow and make use of the moisture, and, incidentally, of the plant food intended for the wheat crop.

When rain enters the ground it envelopes the soil particles with films of moisture, and in soils like those of the Mallee the moisture will be distributed to a depth according to the amount of moisture present. The films on the particles exert a strong tension, and the tendency is to equalize the moisture throughout the soil. The surface may be wet, and under the influence of sun and wind it dries; the films on the particles become thinner and they draw on the moisture below. If evaporation goes on unchecked, very soon the loss is considerable.

Now, it is plain that such movement can take place upwards only when the films are continuous, and if their continuity be broken, as it is, by stirring the surface to keep a loose dry mulch, the ascent of moisture is stopped. A fall of rain may consolidate the surface, and evaporation of the moisture reserves in the soil begins anew. The loss is greatest when the moisture content is high. No time should be lost after rain in summer to restore the loose surface mulch.

It has been laid down as the result of observation and experiment that this loose surface mulch should be about 2 or 2½ inches, and the

soil beneath that should be consolidated. In a properly kept fallow this consolidated portion is moist. It is referred to as the seed-bed, and all cultivations subsequent to the first ploughing should leave it undisturbed. It is a busy workshop where germs are making plant food—they can work only when they have moisture and warmth. If this seed bed be allowed to dry out, they cease to function, and if weeds are allowed to develop they are like robbers pillaging the stores of plant food which were prepared for the wheat crop. These plant foods elaborated in the soil are of the utmost importance, and it is the warmth of our climate which permits their production. The liberal use of superphosphate will not avail if they are deficient.

When a fallow is neglected, then the stores of moisture are lost, the preparation of plant foods—including nitrates, &c.—cannot go on. Weeds use the moisture and plant food available; if allowed to seed they will infest the wheat crop, and because some of them are hosts for disease, such as "takeall," which attacks the wheat plant, they have a

Burning the Rolled Mallee.

serious influence in reducing yields. Where self-sown wheat is allowed to develop—and it was noticed in several fallows—conditions are favorable for the propagation of diseases, as the fungi which cause them are never without a host.

Just before seeding the farmer makes an effort to destroy the weeds. He has to cultivate deeply to cut them out; he destroys the seed-bed, and no matter what surface tilth he may produce, the young wheat seedling will have to root under unfavorable conditions in a loose seed-bed.

At least one farmer encountered, who knew the value of a soil mulch, had worked up his land in fallow while the shoots were thick, and they grew with renewed vigor.

The implements mostly in use in the Manangatang district are the mouldboard plough, the scarifier, and the spring-tooth cultivator, and the harrows. These are all adapted for the conditions. The main

lesson to be brought home is that farmers should not regard the working of fallows merely as a round of operations to be got through between ploughing and seeding; they should understand why fallowing is effective. Every working should have a definite purpose, and it should be understood that one working at the right time will be better than repeated workings later on.

The usual depth of ploughing is from 3½ inches to 4 inches, and where that depth is exceeded it is for the purpose of rooting out stumps. For the most part shallow cultivation is the aim.

The settlers are very earnest workers. There are good farmers amongst them, and because some have already demonstrated the value of proper methods, it is safe to predict that these will be applied throughout as soon as practicable. Those who started the competition are to be commended, as it will be the means of spreading a knowledge of the best practices.

Awards.

Name of Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Maximum Points	**25**	**25**	**25**	**25**	**100**
		CLOONAN CUP.			
James, G. R., Sea Lake ..	24	23½	24	23	94½
Molyneaux, L. J., Manangatang	22½	23½	22	23½	91½
Thomas, J. F., Kulwin ..	22	23	22½	23	90½
Julian, J. M., Mitvack ..	22½	22½	23	21	89
Fisher, C. H., Kooloonong	20	23	23	22	88
Sharp, I. A., Kulwin ..	21½	21	23½	22	88
Lambie, T. S., Manangatang	20	23	21	22	86
Gray, M., Nandaly ..	22	21	21	21	85
Baker, A. H., Manangatang	21	21	22½	20½	85
Drury, D. F., Sea Lake ..	21½	22	21	20	84
Hateley, A., Manangatang	19	20	24	21	84
Sims, H. A., Kooloonong ..	22	20	22	20	84½
Brown, H. W., Manangatang	22	20	21	19	82
Smith, H. W., Ultima ..	22½	21½	20	18	82
Johnson, S. R., Manangatang	21	20	19	20	80
Sullivan, W., Kooloonong ..	22	20	19	19	80
Warren, C., Chillingollah ..	19	19	19	19	76
Gourley, H., Sea Lake ..	17	19	20	19	75
McLeod, C., Ultima ..	19	19	15	17	70
		MANANGATANG CUP.			
Lambert, L., Manangatang	23½	24	24	24	95½
Sharp, I. A., Kulwin ..	21½	21	23½	22	88
Wharton, R., Kulwin ..	21	21	24	20	86
Heller, L., Kulwin ..	19	19	19	19	76
Vanderfeen, A. D., Pier Millan	17	19	20	19	75
Connell, R. C., Manangatang	19	18	15	19	71

Methods Followed on the Best of the Competing Fallows.

Mr. L. W. Lambert presented a very fine exhibit. The fallow had a good mulch overlying a compact, moist seed-bed. The land was very clean

and even hand-hoeing had been practised to keep down paddy-melons. The moisture content of this fallow was good. The block had been well cleared; it was first cropped in 1915, and the last crop was grown in 1922. In 1924 the land was ploughed during June and July to a depth of 3 inches with a mouldboard plough. It was harrowed in August, spring cultivated in September, and harrowed. At the beginning of November it was again spring-toothed and harrowed, and it was harrowed once more during the first week in February.

Mr. G. R. James showed an area of fallow on land first cropped 25 years ago, but it had not been in crop since 1921. The soil differed from all the others inspected; it was of heavier texture, and there were outcrops of iron sandstone. This fallow was clean, the surface was somewhat ridged, and the mulch on the deep side. The seed-bed was level and well charged with moisture. The land was ploughed 3 inches deep with a mouldboard plough in August, harrowed in September, scarified with 6-in. tynes very lightly in October, and spring-tooth

A Mallee Roller.

cultivated as lightly as possible in November. Sheep had access to the paddock throughout. Mr. James believes in shallow cultivation and likes both the scarifier and the spring-tooth cultivator.

Mr. Molyneaux's exhibit was a good one, and its condition reflected intelligent working, inasmuch as over the greater area there was a nice knobby mulch with a compact moist seed-bed beneath. Shoots had been well eradicated, but mustard was thick enough to be a blemish. The land was first cropped in 1921, and again in 1922. In June and July of last year the land was ploughed with a mouldboard plough 3 inches deep, harrowed after ploughing, scarified in October, harrowed in November, spring-tooth cultivated across in December, and harrowed and cross-harrowed in January and February.

The fallow shown by Mr. J. F. Thomas was fairly clean, but mustard was scattered throughout, and self-sown wheat was in evidence. Small stumps were spread over the surface, but shoots had been well eradicated.

The mulch was fairly good. The land in fallow was rolled in 1920, and three crops in successive years were taken off. In 1924 the land was ploughed in July and August with a five-furrowed mouldboard plough to a depth of 5 inches. After ploughing the land was harrowed in two directions. After rain in September it was again harrowed twice. In October it was scarified after rain and afterwards harrowed. In November it was once more harrowed, and later the flats were cultivated once with the spring-tooth cultivator and harrowed twice. The scarifier with broad tynes has done good work on the flats. Ploughing 5 inches deep was found advantageous on previous occasions, and is necessary to eradicate stumps. Shallow cultivation is the aim. Sheep are considered a great ally. Mr. Thomas is a firm believer in good methods. His experience during 1924 was that 100 acres of fallow was as productive as 450 acres of stubble land.

Mr. C. H. Fisher showed an area of fallow which deserves mention, because the land was cleared and broken up only last year. It had

The Fire-rake in Operation.

borne a mixture of Mallee, Murray pine, wilga, buloke, &c., and after clearing it was ploughed with the mouldboard plough in August and September. The ploughing was good or bad, according to the condition of the ground, and the sundercut was used across the ploughing in October and November to complete the breaking. After rain in January the land was spring cultivated, and again in February, to a depth of 2 inches.

The late ploughing was not conducive to best results. There had not been a good conservation of moisture. The mulch was on the deep side and the seed-bed uncompacted.

The officers of the Lands Department under Mr. Cloonan gave me every assistance in my work, and I have to express my thanks to Messrs. Breeze, Newton, Matthews, Patterson, and Matheison.

WANGARATTA CROP AND FALLOW COMPETITION, 1925.

Report by R. G. Thomas, B.Ag.Sc., Manager Rutherglen State Farm.

Fallow Section.

Entrants in the Crop and Fallow Competition recently inaugurated by the Wangaratta Agricultural Society are to be congratulated on the general excellence of the fallows entered for competition. Following a season which rendered the working more than ordinarily difficult, these presented at the time of judging a surprisingly clean and well tilled appearance. This fact is also evidence of the value to the district of the forward move of the Society in conducting the competition. The best and keenest farmers are brought into competition, which encourages them to further effort and keener interest, with benefit to all through the consequent discussion and exchange of opinions. Other farmers originally less interested take more notice of their good-farming neighbours by reason of the interest any form of competition inspires. The crop returns of the various competitors are noted by them, and the means by which the results were obtained are made available to all through the report issued by the Society. Thus is the knowledge of the whole district augmented from the practices of its best farmers.

The Competition.

TABLE OF AWARDS.

Name of Competitor.	Moisture.	Mulch.	Weeds.	Evenness.	Total.
Possible points ..	**25**	**25**	**25**	**25**	**100**
W. B. Richardson ..	23	24	25	24	96
A. J. Kerr	22	23	25	23	93
A. E. Sandford	23	22	25	22	92
A. McDonald	22	23	23	23	91
H. J. Clem (No. 1 entry) ..	22	23	23	23	91
W. H. Charlton	23	22	22	23	90
T. P. Jones	21	20	25	22	88
H. J. Clem (No. 2 entry) ..	20	20	20	23	83

Mr. W. B. Richardson's winning fallow was most commendable. It was particularly clean and had a nice cloddy mulch of about the right depth, though hardly as uniform as it might have been in respect to this feature. The seed-bed was nicely consolidated and moist, but a trifle ridged. The soil was mostly a reddish clay loam, 6 inches deep, running to patches of grey; subsoil a red clay with a more open yellow clay below. The land was in wheat for two years prior to fallowing. Cultivation—Ploughed 5 inches deep with mouldboard plough, July-August; cultivated with rigid-tyned "combine" 4th September, harrowed 9th October; cultivated with rigid-tyned combine 24th October, harrowed 13th November; and cultivated with rigid-tyned combine 27th

November, 24th January, 21st February, and 24th March. Much of the work had been carried out with tractor-drawn implements.

Mr. A. J. Kerr's entry was also very creditable. It was equally clean, but hardly so moist as the winning fallow. The mulch was nice and cloddy, about 2 inches deep, but showed a slight skinning over from recent rain. It was fairly uniform in depth, and the seed-bed below was level and fairly well consolidated. The land was a heavy clay loam overlaying a heavy clay subsoil. It was ploughed from 5 to 6 inches deep in early September, harrowed after ploughing, and cross-harrowed a fortnight later. It was then disc-cultivated early in October and harrowed again. Scarified with "Coleman" type of scarifier in December, in January, and again in March, and subsequently harrowed in March.

Mr. Sandford's fallow was nice loamy soil about 6 inches deep over a red clay sub-soil. It was clean; the mulch was generally a fair depth, but irregular in this respect, and was rather too fine. The seed-bed was rather open and irregular in places. The moisture content was good. The land was ploughed 5 inches deep early in September, "drag" or "smoodge" harrowed in October, disced from 3 inches to 4 inches deep in November, drag harrowed early in December, disced from 3 inches to 4 inches in February, and drag-harrowed in March. The irregularities in the mulch and seed-bed above referred to were apparently due to deep and uneven cultivation with the disc implement.

Mr. McDonald's section evidenced careful working, but he was handicapped by difficult and irregular soil conditions. The land was mostly a greyish soil with a friable yellowy subsoil, varying to patches of nice red loam overlaying a good red clay subsoil. Cultivation—Ploughed 6 inches deep end of August, harrowed mid-November, spring-tooth cultivated early December, disc-cultivated February, and in March spring-toothed with "combine", and 7 cwt. burnt agricultural lime per acre applied.

Mr. H. J. Clem's No. 1 entry showed a mulch that was fairly rough, yet had a lot of very fine soil between the lumps, and consequently a tendency to skin over. The depth was about 2 inches and regular; the seed-bed was level and fairly well consolidated. A little couch grass was present. The soil was a free clay loam from 6 inches to 7 inches deep, with a good friable clay subsoil. It was ploughed to 6 inches in August, and subsequently harrowed twice, disc-cultivated in November, harrowed in January, scarified ("Coleman") in February, and harrowed early in March.

Mr. W. H. Charlton's fallow was a nice friable loam, 6 inches deep, overlying retentive red clay. It contained a few weeds. The mulch was cloddy, but rather deep and irregular in regard to surface and consolidation. Cultivation—Ploughed 5½ inches deep mid-August, harrowed and cross-harrowed September, spring-tooth cultivated 3 inches deep end of October, scarified ("Coleman") November, and again in mid-February.

Mr. T. P. Jones' land was a fairly heavy clay loam, from 6 to 7 inches deep, with patches of friable clay. It was ploughed 6 inches at the end of September and harrowed, cross-harrowed in October, disc-cultivated at the end of November, and again at the beginning of March. The mulch was cloddy, yet powdery, and too deep, going nearly to the depth of ploughing, and the soil below was open and uneven. The land was very clean.

Mr. H. J. Clem's No. 2 entry was adjacent to his No. 1 entry, but the soil was of a more sandy nature and contained some buckshot. The clay subsoil was 1 foot or so below the surface, with a marl between it and the soil. The paddock was cultivated similarly to the No. 1 entry, but in each cultivation the implement was worked deeper than in the case of the No. 1 fallow. The mulch was too deep and rather fine; weeds were present, and the moisture content was rather low.

The Preparation of Fallows.

Three points of general interest in regard to the preparation of the fallows are:—(1) the relatively early fallowing period of the better fallows, i.e., from July to early September; (2) the depth of ploughing, being what is generally regarded in wheat cultivation as deep ploughing; (3) the relatively slight extent to which the disc-cultivator was used in the preparation of most of the better fallows.

In regard to the first two points—the early and deep fallowing—it is interesting to note that the wisdom of both these practices in such a district is confirmed by the results from experimental plots at the nearest Departmental farm at Rutherglen. Certainly soil and climate conditions are not identical, but the latter approximate closely, and certain of the soils are rather similar. The results from two series of cultivation tests over a period of eight years are set out in the tables below, and the figures are sufficiently conclusive to require no explanation.

Depth of Ploughing Tests—Rutherglen State Farm.

Average Results for Eight Years.

Treatment of Plot.	Average Yield.
	bushels per acre.
Ploughed 3 inches deep in July, and cultivated as necessary ..	16·9
" 5 " " " " " ..	20·9
" 7 " " " " " ..	22·5
" 9 " " " " " ..	22·1

Time of Fallowing Tests—Rutherglen State Farm.

Average Results for Eight Years.

Fallowed July, and cultivated as necessary	22·5
Fallowed October, and cultivated as necessary	17·7

Tractor *v.* Horses.

The slight use made of the disc-cultivator is gratifying, particularly in view of the very heavy falls of rain which were experienced during the season. It indicates that the soil can usually be effectively cultivated without recourse to this implement, provided the farmer be keen enough and able to attack it at the right moment. The period over which this can successfully be done, especially after a heavy downpour, is limited, and often, unfortunately, the cultivation of the fallow has to be postponed on account of more urgent work. Mr. Richardson was able to bring his land to a high state of excellence without the use of the disc-cultivator. This was probably in some measure due to his working with

a tractor, and this point, the ability of one man and one implement to cover more ground at the critical time with the use of a tractor as against horses, is one that must be allowed when considering the relative merits of the two forms of draught. Furthermore, it is one the value of which is most difficult to estimate, since it may at times completely offset even a higher cost per acre of any operation.

The Best Type of Scarifier for the District.

The successful use by Mr. Richardson of the rigid-tyned cultivator, and by others of the "Coleman" type of scarifier, suggests the "Wimmera" scarifier as a type of implement that may prove useful in the district. No reports of the use of this implement there were received, but there is little doubt that it would prove a better weed-killer, maintain a more uniform depth of tillage, and work stiffer soil than either of the implements mentioned above. It is of more rigid construction than the Coleman scarifier, and the feet would be expected to cut into hard ground better than the flat share used on this implement. The merits or otherwise of such a type of implement under district conditions should be at least worth investigation, and it would be thought that, in the hope of their successful introduction, the various makers would sell into a new district on a guarantee basis.

MAFFRA COMPETITIONS, 1925.

Report of the Judge, L. C. Bartels, B.Ag.Sc., Chief Irrigation Field Officer.

The Crop and Stack competitions conducted by the Maffra Agricultural Society this year attracted an increased number of entries, but the society deserves greater patronage. By giving prizes for haystacks (oaten and lucerne), for beet crops (irrigated and unirrigated), and maize crops, it has catered for all sections, and while a fairly high standard of farming is evidenced, the work of the society is to demonstrate the methods of the best farmers, and to encourage the adoption of better practice by all. This is effectively done by the competitions.

Beet.

The beet crops exhibited were generally of a high standard. In judging, points were allotted for cultivation, thinning, and freedom from disease, while the probable yield was determined by weighing representative samples from different parts of the field. The sugar content of the beet at the time of judging was determined by Mr. Pywell and his assistant, through the courtesy of Mr. Williams, manager of the sugar factory.

UNIRRIGATED.

Mr. Hales' exhibit of beet was a very good one. There was not much top growth, but the roots were of nice size and shape. The land had been in beet the previous year. Before ploughing, the land was cultivated to loosen the surface and prevent its turning up in lumps.

In August it was ploughed 10 inches deep and worked down to a good tilth. Sowing was carried out in November, which was later than usual. Superphosphate was put on at the rate of one bag per acre. The crop had been regularly thinned, and it had had three cultivations. It was very free from weeds.

Mr. F. Scott's competition beet was grown on land which was in oats in 1923, and in the autumn of last year it was disc-ploughed 8 inches deep, left lying for several months, and again ploughed to the same depth, worked down with disc cultivator, harrows, and roller, and then sub-soiled across with a two-furrow plough from which the mould-boards had been removed. The beet was sown in August—12 to 14 lb. of seed, with one bag of bone and superphosphate per acre. Bone and superphosphate is preferred to superphosphate. Mr. Scott's practice is to cultivate before thinning, and again immediately after the plants have recovered. The crop had seven inter-cultivations in all, and it was very clean as a result. Some of the plants were running to seed. The crop was not as regular as it might have been, but the ground has not a good physical condition, and many of the roots were forked. Mr. Scott has tried peas as a green manure to improve the land.

IRRIGATED.

Mr. Bennett's crop of beet was grown on land which had been grazed for a number of years prior to 1924. In August it was disc-ploughed a foot deep, and after two months re-ploughed 1 foot deep across the first ploughing. It was sown late in October—seed 10 lb. per acre, with 80 lb. of superphosphate and bone manure. The crop made a good start and germinated evenly, and thinning was done when it had been in only three weeks. During its growth the crop was cultivated four times, and was hand-hoed twice. It had a very heavy top growth, and was dense and regular, but there were a fair number of weeds. The roots were large and well shaped. The crop had had one watering (in January); the water was distributed with a hose, but Mr. Bennett had no idea how much was applied.

Mr. Harris showed a crop of beet which was clean, but irregular in places. Previously the land was cropped with oats in 1923, and in May of last year it was ploughed 4 inches deep and left till July, when it was disc-ploughed 8 inches deep, and afterwards worked down with roller and harrows. It was sown during the second week in August at the rate of 12 lb. of seed per acre, with 2 cwt. of bone and superphosphate, which was chosen because of its lasting effect. The land had been irrigated, and the effect of the water was very evident by contrast with a patch which had been missed in irrigating.

Oaten Hay Stack.

THATCHED.

Mr. P. Gannon's thatched stack of oaten hay, which was built by Mr. Brewis, was adjudged the best in that class. It was a round stack, symmetrical, neatly trimmed, and well built. The sides had a fair spring outwards; the roof was well tapered and of nice height and well thatched. The hay was Algerian oats grown on oat stubble, but in spite of that it was of fair quality, grainy, clean, and free from weeds, with just a little rust.

Mr. Templeton's exhibit in this section was fair. His stack was bedded on logs, and the walls had just the necessary spring, although the ends were uneven. The roof was rather low in comparison with the bulk of the stack, and so had not as steep a slope as desirable, but it was well thatched. The hay was of nice length, with a good proportion of grain, but rust and mildew were in evidence, and wild oats and drake were noticed.

In stacking Mr. Templeton builds throughout by hand. In the second tier of sheaves and upwards, the sheaves from the second row to the centre are placed with heads out. The walls are built 13 feet high to the eaves, and the ridge 9 feet above.

The stack exhibited by Mr. Murray was on a foundation of logs. It had a fairly high roof of good pitch, with a well defined eave row. It was not altogether symmetrical. The hay was short and contained a fair amount of sheep's sorrel. Mildew and rust depreciated the quality. There was an admixture of wheat. The oats was grown on stubble land ploughed in April, worked down and sown immediately. The crops were seeded at the rate of 2 bushels per acre, and manured with blood, bone, and superphosphate at the rate of 90 lb. per acre.

In building, Mr. Murray keeps the centre hearted up by occasionally introducing a layer with the heads out, and working to the centre, and then resuming with butts outward where the inverted rows were commenced. He builds throughout with the fork, and finds it quicker and easier than building by hand; the outside rows are not so tightly packed and settle more than the inner rows, with a consequent dip outwards. An eave row is laid down, and the top of the stack is kept hearted up in the manner indicated above; two outside rows are put in position at the same time.

UNTHATCHED.

Mr. F. Blythe showed two oaten stacks in the unthatched section. The better one was on Mr. Langshaw's property. The hay had been grown on stubble, but it was of fair length, clean, and with a good proportion of grain. It was somewhat flaggy, and a little drake was noticed. The stack was a good one in symmetry, shape, roof, and slope of sheaves. The hay was on logs, and the sides of the stack were perpendicular. Mr. Blythe's second exhibit was on his home property, and was of high merit also, but the hay was short although grainy, and there was an admixture of barley. Rust was in evidence. The stack was evenly built, the walls had a nice spring, the roof was steep, and the outside sheaves had a fair slope. This stack was bedded on straw.

Mr. Blythe builds with his hands, and "kneels" the sheaves. All but the outside rows are placed with the heads out. He grows Algerian oats, and sows 2¼ bushels per acre, with ½ cwt. superphosphate—quantities which he considers right. The hay in the stack exhibited was grown on barley stubble; the land was ploughed in April, worked down and sown.

Lucerne Stack.

THATCHED.

Mr. P. Gannon presented the only thatched stack of lucerne inspected. It was an evenly-built stack, with the walls showing a slight spring outwards to the eaves. The top was not drawn in at the ends, and the end walls had an outward slope. It was neatly thatched, and

the roof was of fair height with a good uniform slope. The hay—made from the second cut of the season—was leafy, of good colour and small. A little grass and white clover was mixed with the lucerne.

Mr. Gannon cuts the hay just after blooms appear. He believes in hand cocking the dumps of hay. He has not used manure—the lucerne being grown on rich land. He scarifies with the spring cultivator to thin out weeds and let air into the ground. In building he keeps the centre of the stack well filled, and each outside row of hay overhangs slightly the lower layer.

UNTHATCHED.

In the unthatched lucerne stacks Mr. Mitchelmore showed a regularly built stack, with the walls slightly sprung to the eaves. The roof was of medium height and well pitched. The hay, taken from two cuts, was fine stemmed and leafy, but some leaf spot was apparent, and grass was also showing.

Mr. Tucker's stack was from the third cut of a crop of French Provence lucerne. The hay was clean and the stems were fine, but woody. The stack was regular in outline, with the walls perpendicular and topped with a good roof.

Mr. Hales' stack of lucerne was of very fine quality, and the stack has been well built, but not roofed properly. It was raised from the ground on a platform. Hand-cocking is practised by Mr. Hales when hay-making.

Maize.

The maize crops inspected were not very promising, but this was mainly attributable to the unfavorable conditions which prevailed during the early part of the season. The crops had apparently been well looked after, but attention is again drawn to the necessity for greater care in the selection of seed, particularly in the direction of obtaining earlier maturing maize. When for any reason sowing is delayed it is advisable to look for an earlier variety, and it is suggested that superphosphate may be used to advantage to increase yields and hasten maturity.

Mr. Kerr's exhibit of maize was by comparison with the others a good one, showing a fair development of ears. The plants were tall and advancing to maturity, but many were late. The land in crop was lea land which had been ploughed in July to a depth of 4 inches, then dragged and harrowed. It was ploughed to a depth of 12 inches in August, scarified 6 inches deep, harrowed and rolled, and again ploughed 5 inches deep in October. It was sown on 23rd October at the rate of 12 lb. seed per acre, the objective being three seeds per hill. The seed was locally grown—the variety an unnamed Yellow Dent. No manure was put on. The crop was cultivated seven times and suckered, the idea being to keep the strength in the main stem.

Remarks on Beet Growing at Maffra.

Many of the probems confronting beet-growers at Maffra require investigation. The methods of good farmers are advertised through the competition, but guidance is needed in regard to manuring and watering. This latter operation will assume a greater importance in future years. Cultural methods are more or less standardized. The seed

(imported) is sown at the rate of from 12 to 14 lb. per acre on unirrigated land, and from 10 to 12 lb. per acre on irrigated land. The rows are 18 inches apart, and the plants are thinned to distances of from 10 to 12 inches apart in the rows. The time of sowing varies from August to November. It was noticed that the earlier sown beet showed a tendency to run to seed, while some of the later crops were still making good growth when inspected.

All growers realize the value of phosphatic manures, and one or two had used nitrate of soda with apparent advantage. Superphosphate alone, and bonedust and superphosphate, are the common manures, and the rates of application varies from 80 lb. to one bag per acre. Opinions varied as to the best form of manure to use.

The irrigated beet inspected had been given only one watering, and no definite information could be obtained as to how much water was used. On the farm of Mr. Harris there was ample evidence to show the value of watering in augmenting yields.

Most of the beet crops inspected were relatively clean. The growers recognize that good cultivation is essential, and that if weeds are permitted to grow they use the moisture and plant food which should go to the crop.

Necessity for Use of Fertilizers.

All who are growing crops without manure and selling produce or stock from the farms should realize that they are mining their soils, and as certain plant foods are available only in limited quantities they should not wonder that their yields fall off, or that weeds will thrive and increase while crops and pastures do not.

The argument that manure is unnecessary when rain is abundant is untenable. Phosphate manures contain a very necessary plant food—phosphoric acid—which is deficient in most Australian soils. There are various manures which supply this deficiency. The most common are superphosphate, and bone and superphosphate. At Maffra it would seem that bone and superphosphate is more in favour because, it is asserted, it keeps the land in better heart. This is a very laudable objective, but how far it really is effective in that direction is not known. Certain it is that the phosphoric acid in bone is only slowly available, though the nitrates, potash, and other minerals which it supplies may have a slight influence. Many farmers use superphosphate and find it effective. In this manure the phosphoric acid is readily available.

It is suggested that all crops at Maffra—beet, oats, lucerne, maize, &c.—should be manured, and manured liberally with phosphatic manure. The relative value of different forms under the conditions prevailing can be determined only by experiment.

Keeping the land in good heart is all important, and on some of the beet land in the district is becoming a serious problem. A rotation of crops, including legumes, is recommended. Mr. F. Scott has found green manuring with peas fairly effective. Red clover should be a good crop in rotation, and lucerne, which, of course, occupies the ground for several years, leaves the physical condition improved.

Rotation crops permit better preparation for the beet crop, inasmuch as the ground can be stirred earlier to receive the winter rains, thorough preparation of the seed bed is possible, and, moreover, it is a security against the spread of disease. Fortunately, there is not much evidence of disease in the beet at Maffra; only a little rust was common.

Awards.

The results of the second annual competitions are given below:—

Name of Exhibitor.	Yield of Topped Beets.	Sugar Content.	Thinning.	Cultivation.	Freedom from Disease.	Total.
Possible Points ..	**50**	**25**	**20**	**20**	**5**	**100**
BEET (UNIRRIGATED).						
Hales, W. H. ..	43½	22	19	19	4	107½
Scott, F.	36	25	17½	19	4	101½
Tucker, C. ..	41	19	18	18	4	100
Pearce, E. ..	34	21	18	19	4	96
McLean, A. C. ..	33	21	18	18½	4	94½
Martin, A. ..	32	20	16	18	4	90
Jorgenson, F. ..	24	24	18	19	4	89
Millier, E.	17½	17½	19	15	4	73
BEET (IRRIGATED).						
Bennett, E. T. ..	50	16	18	16	4	104
Harris, C. ..	41	18	17	18	4	98
Caffrey, H. (B) ..	40	15	18	17	4	94
Caffrey, H. (A) ..	39	13	18	17	4	91

MAIZE CROP.

Exhibitor.	Yield.	Cultivation.	Total.
Possible Points	**50**	**25**	**75**
Kerr, W.	50	23	73
Caffrey, H.	35	22	57
McCarthy, J. J.	10	23	33

Competitor.	Quality of Hay.	Building.	Weather Resistance.	Total.
Possible Points	**50**	**25**	**25**	**100**
OATEN STACK (THATCHED).				
Gannon, P.	45	24	24	93
Templeton, James	40	20	23	83
Murray, W. A.	39	19	23	81
Fitzpatrick, V. G.	40	16	22	78
OATEN STACK (UNTHATCHED).				
Blythe, F. (B)	46	23	21	90
Blythe, F. (A)	42	24	21	87
Kingscott, S.	40	22	20	82
LUCERNE STACK (THATCHED).				
Gannon, P.	45	22	24	91
LUCERNE STACK (UNTHATCHED).				
Mitchelmore, W.	43	23	20	86
Tucker, C.	41	24	19	84
Hales, W. H.	48	20	15	83

PACKING OF CITRUS, APPLES, AND TOMATOES.

For the guidance of fruit-growers, wall-sheets showing the approved ways of packing citrus fruits and apples, for both the local market and for export, have been prepared under the direction of Mr. J. M. Ward, Horticultural Superintendent.

A poster, illustrating the various methods of packing tomatoes, has also been printed.

Copies of any of these three posters are obtainable, free of charge, from the Horticultural Superintendent, Department of Agriculture, Flinders-street Extension, Melbourne.

YARRAWONGA CROP AND FALLOW COMPETITION.

Report by R. G. Thomas, B.Ag.Sc., Manager, Rutherglen State Farm.

The report on the judging in connexion with the Yarrawonga Agricultural Society's crop and fallow competition has previously been presented when dealing with the competition for best 50 acres of fallow. Opportunity was then taken to point out the difficulty of judging when it is specified that the whole of the paddock (minimum 50 acres) is to be judged. This view is further driven home when one is confronted with the task of inspecting a veritable sea of some 750 acres of splendid wheat crop in one paddock. Surely a crop of these proportions cannot reasonably be compared with that in a paddock of 50 acres or so. A further advantage in specifying only the minimum area required is that a competitor is encouraged to special effort on that area, perhaps portion of a large paddock, and he is then likely to be in a position to decide whether the extra working, more liberal use of seed and manure, or other variations practised on the competition crop might, with benefit, be applied to his whole cultivation area. Information on this point is the object for which the competition is conducted.

Crops throughout the competition were for the most part excellent, and difficulty was experienced in separating the leading contestants. The average yield was very satisfactory; very little disease was present, and, except sometimes a sprinkling of wild oats, very little weed growth was observed.

Mr. J. Stevenson secured first award in both sections, with 91 points for fallow and 96 points for crop. His crop of Federation was heavy, even, free from strangers, and contained only a few wild oats. A little flag and loose smut was present. Details of cultivation up to time of

judging fallow were given in report on fallow competition. Subsequent to this the paddock was cultivated with a spring-tooth, with smoodger attached, the first week in May, drilled and harrowed immediately afterwards. Sixty pounds of seed and 60 lb. of 18 per cent. superphosphate were applied.

Equally good in the crop section was Mr. P. Connell's No. 2 entry. This, with 96 points for crop and 89 for fallow, secured second place. The major portion of the crop consisted of Federation, with some 12 acres of the new varieties Nizam and Wannon. Mr. Connell is to be commended for his enterprise in giving such new varieties a trial. These crops were not at all showy, but gave indication of heavy yield. The whole area was very even, with crops a nice height, clean in the straw, and well headed—the type of growth which the wheat-grower desires. The fact that Mr. Connell sowed this crop in mid-May with 70 lb. of seed and 112 lb. of 22 per cent. superphosphate is worthy of note, as it goes to show the fallacy of the contention often heard that heavy applications of superphosphate are followed by a rank growthy crop. In this respect, the crop under discussion was the best inspected, and the application of manure was heavier than that of any other competitor. This paddock was summer fallowed, and, after the cultivation detailed in the previous report, it was scarified, drilled, and harrowed in mid-May. Traces of flag and loose smut were seen, but no ball smut. Mr. Connell has adopted the practice of pickling with dry copper carbonate powder (2 oz. per bushel of seed), using a home-made barrel device for the purpose, and finds this method most effective and convenient.

Mr. A. Browning also showed an excellent crop of Federation, even and dense, though a little growthy. Some wild oats were present, and a trace of loose and flag smuts. This crop was sown during the end of April and early May on land that had been previously disc cultivated. Sixty pounds of seed and an equal weight of 22 per cent. superphosphate were sown. Mr. Browning is a firm believer in early sowing, a practice which he has followed with marked success for many years. He has made some valuable observations during this time, and his advice, when commencing sowing before the autumn rains have fallen, is as follows: —Choose a clean paddock which will work up a little on the rough side (this will not then so readily puddle and drown the seed should heavy rains occur), and sow very shallow, using old worn points on the drill hoes.

Little or no information as to the relative merits of summer and winter fallow could be deduced this season. The winning crops of Messrs. Stevenson and Connell were grown on summer fallowed land, but excellent crops, which it would be difficult to say would not yield as well as those mentioned, were grown on winter fallowed land. In fact, a strip of Mr. Connell's No. 2 entry was winter fallowed, and no difference was observed in this section. In all cases, the heavier crops were grown on fallow which had been thoroughly worked, ensuring a crop practically free from weeds and diseases.

Sufficient moisture to meet the requirements of the crops had evidently been conserved by either summer or winter fallow, well worked;

but it must be remembered that the past season was not one to test the moisture-conserving possibilities of any system of cultivation, abundant rain being received throughout practically the whole of the time during which land was under fallow and crop. Those who have adopted the practice of summer fallowing should not be discouraged, as the method has given most satisfactory returns, and is at least worth while persisting with to determine whether it will not show a profitable increase in yield over the average of normal seasons.

TABLE OF AWARDS.

For best paddock of not less than 50 acres.—Fallow 1923, and Crop grown thereon 1924.

Competitor.	Yield.	Trueness to Type.	Absence of Weeds.	Absence of Disease.	Evenness.	Total Crop.	Total Fallow.	Grand Total.
Possible points ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
J. Stevenson ..	35	19	14	14	14	96	91	187
P. Connell, No. 2 Entry	35	19	14	14	14	96	89	185
A. Browning ..	34	19	13	14	15	95	84	179
J. McPherson ..	33	19	13	15	14	94	85	179
W. L. Prescott ..	34	16	14	13	14	91	88	179
J. Johnstone, No. 1 Entry	26	18	14	14	14	86	88	174
P. Connell, No. 3 Entry	29	19	14	13	13	88	85	173
P. Connell, No. 1 Entry	30	19	14	14	12	89	81	170
J. Johnstone, No. 2 Entry	28	18	14	15	15	90	79	169
R. Lewington, No. 2 Entry	28	18	11	13	14	84	80	164
J. Fraser ..	23	18	11	12	12	76	87	163
A. McPherson ..	32	18	13	14	13	90	72	162
R. Lewington, No. 1 Entry	25	17	10	14	14	80	73	153
J. Lonsdale ..	27	16	9	12	13	77	75	152
L. Riley ..	21	18	8	13	10	70	67	137
J. Forge ..	23	14	9	14	12	72	60	132

THE SMALL DAIRYMAN.

How Can He Better His Position?

By A. W. Bethune, Dairy Supervisor.

Within a short distance of Melbourne there is a comparatively large number of small dairy farmers engaged in the production of milk for the metropolitan supply, who, owing to their limited grazing areas, with the corresponding necessity of extensive hand-feeding more or less all through the year, are working under high production costs; consequently, many find it a difficult matter to do little more than square the ledger at the end of each year. This applies more especially to the tenant farmer or the man who has bills of principal and interest to meet. A number of such have at various times informed me of their difficulties in trying to pay their liabilities without allotting any amount as payment for their year's work or making any provision for repairs and improvement of their premises.

The feeding and care of the cows are usually well attended to, and the dairy farmers work long hours, yet, in the opinion of the writer, much of the blame for their unsatisfactory financial position is attachable to themselves, and the remedy, in many cases, lies in their own hands.

Owing to their proximity to, or inclusion in the metropolitan area, with the corresponding advantages of the retailer being able to have the milk delivered at his premises in from one to three hours of its production, and the reasonably consistent supply of a good article, these dairymen receive the top ruling price for their milk, yet the fact remains that many of them are not receiving anything like a sufficient return from the capital invested and the labour involved.

On these confined dairy farms high individual milk production should be the aim, and each cow should be expected to do her fair share. Time and again I find herds barely paying their way, although being fed liberally on a fairly well-balanced ration. On asking an owner the milking capabilities of any individual cow in his herd, the usual answer is that he does not know, but he almost invariably adds that when she first came in she gave so many quarts, as the case may happen to be. This performance usually appears to satisfy him that the cow has well earned her place in the herd irrespective of whether she keeps up a good milk yield for one month or ten.

Until these men, who, in some cases, pay from £7 to £9 per cow per year for bran alone, and who also buy chaff, meals, &c., realize that to know the amount of milk per year each cow in their herds is producing, and to act on the information gained, ranks in importance with proper feeding to make milk production profitable, so long will most of them be slaving at the industry for a mere pittance.

The owner of a small dairy herd often has the best of opportunity of recording the quantity of milk yielded by each cow and of studying them, as often he does all the feeding, milking, and general handling of his cows himself, or perhaps with the assistance of one or more members of his family, while the large dairy farmer has to rely on hired labour.

Notwithstanding the self-evident fact that cows vary greatly in milk-yielding capacity, it is difficult to get most dairymen to keep any sort of record of the quantity of milk obtained from individual members of

the herd. It is the "intermediate" cow which is the curse of many herds. If she were a really worthless milker, the most careless dairy farmer would get rid of her, but on account of her fairly high milk yield when freshly calved, or her ability to produce just enough milk to delude her owner into thinking she is paying her way, she retains her place in the herd. It is this class of cow which it is very difficult to detect except by a systematic daily or weekly weighing of milk over a lactation period. Even those herds which have a high average milk production, but in which weighing and recording is not practised, would be improved by a vigorous milk-recording system, as there is almost sure to be one or more cows whose milk yield would be much below the best cows, and which could be culled and replaced to advantage.

If dairy farmers who have to buy the greater portion of their fodder would only realize what the saving to them in money would be by making full use of the scales, and by culling the duffers and those cows not quite good enough, there would be nothing like the number of struggling dairy farmers and of failures there is at the present time. When it is realized that an average full-grown dairy cow requires approximately 10 tons of fodder per year for the maintenance of her body (during portion of which time she is nourishing the growing fetus), and for every 75 gallons of average milk produced, approximately an additional ton of fodder is necessary. Thus one cow producing, say, 750 gallons of milk per annum, consumes 20 tons of fodder during that period (10 tons for maintenance and 1 ton extra for each 75 gallons of milk yielded), and two cows each giving 375 gallons of milk per annum consume 30 tons of fodder for the period (each 10 tons for maintenance of the body, &c., and 1 ton for each 75 gallons of milk produced). It requires very little arithmetic to show that the saving in fodder by having the one good cow in place of the two inferior ones amounts to 10 tons—a big item in itself—but one which must be multiplied many times in the case of a heavily-fed herd containing a number of inferior cows. As well as the saving in money there would be a corresponding saving in labour; there would be less stock on the premises, yet more milk would be produced.

On every dairy farm there should be none but good cows, capable of producing from 700 gal. to 800 gal. in a lactation period of from nine to ten months, and heifers that will give from 400 gallons up, according to age.

It is only too true that for some unaccountable reason there exists in the minds of many prospective dairy farmers, whose actual practical experience of the industry is very limited, that less capital is required with which to begin dairy farming than to start any other business. It is this ignorance, combined with a want of financial backing, which often leads a new man to commence with a herd of nondescript cows, and thus begins a hard struggle, to be continued till at last he becomes disheartened or fails financially. Too often the dairy farmer thinks it is numbers that count, whereas the successful man's motto is "Quality before quantity."

When a satisfactory herd has gradually been built up, the owner should endeavour to purchase a pure-bred bull whose ancestors have been tested, and have authentic production figures on both sires' and dams' sides. The Victorian Government Standard Herd Tests records are the most reliable in this regard, and should be availed of.

In small herds when the bull reaches two years of age, the owner might allow a limited number of outside cows to be served, for which a fee of, say, from 7s. 6d. to 10s. could be charged. This practice, however, is not to be recommended, as there is always the danger of infectious diseases being brought on to the farm.

Once a dairy farmer has the right bull it pays handsomely to rear a limited number of heifer calves from the best cows in the herd. Then after the first calves reared come into milk, each succeeding year sees the culls (of which from one cause or other there is sure to be several when a rigid system of culling is employed) replaced by heifers bred on the farm. These heifers in turn must have their milk weighed and recorded, and be culled as rigorously as the rest of the herd. Sentiment must not be allowed to supersede business regarding these home-grown heifers, and there is bound to be an occasional one which turns out a "duffer," or, at any rate, falls below the standard set. The great object should be to have all cows reared on the farm, better milk producers over a number of years than were their dams, and this is possible only when they are by a pure-bred bull of proved stock.

To sum up in a few words—What every dairyman should aim at is **Better Cows, Less Labour, and a Reduction in the Total Feed Bill.**

THE NECESSITY FOR PASTEURIZED MILK IN CHEESE-MAKING.

By Geo. C. Sawers, Cheese Expert.

The improvement in the quality of cheese made from pasteurized milk, as compared with that from non-pasteurized, is very marked indeed. Many instances can be given where, following on the installation of a pasteurizing plant, the whole of the cheese made at some New Zealand factories has been of first-grade quality, and the value of the article has, in some cases, as compared with the previous output, increased by a half-penny a lb., in others by as much as a penny. The improvement in keeping quality has been particularly evidenced.

Cheese made from properly pasteurized milk maintains its quality very much better under storage conditions than that made from milk which has not been pasteurized, and it also stands transit difficulties better. Another advantage of pasteurization is that it permits the manufacture of cheese containing a higher water content without lessening its keeping qualities.

With pasteurization the milk remains in practically the same condition from day to day, thus giving a greater degree of uniformity in the quality of the cheese. There are several other benefits which clearly prove that the installing of a pasteurization plant in cheese factories is a paying proposition. Cheese-makers are well aware of the heavy loss sustained through working with milk delivered in an over-acid condition during the summer months. Pasteurization will entirely overcome this difficulty, and the saving during a season or two would almost pay for the cost involved.

At different stages of the cheese-making process, losses of fat occur, but they may be considerably decreased by pasteurizing milk. For instance, it is found that the average loss of fat in the whey is .05 per cent. less with pasteurized than unpasteurized milk.

The full benefits of pasteurization, however, cannot be possibly obtained unless the work is carefully performed. Very careful attention must be given to the working of the plant, and to the manufacture of cheese in order to obtain best results. A temperature from 160 to 165 degrees Fahr. should be aimed at; the machines in use are so well constructed that if reasonable care be exercised no difficulty will be experienced in maintaining a temperature between these points. If the temperature of the milk be allowed to fall below 160 degrees injurious germs will not be destroyed, and the chief benefit to be derived from pasteurization will, of course, be lost. On the other hand, if the temperature be raised above 165 degrees Fahr. the casein contents of the milk will be so injured that, to a very great extent, the curd obtained will lose its cohesive properties.

Irregularities and faults found in many brands of cheese have been proved to be the result of failure to maintain an even temperature of the milk during pasteurization. It is also very important that the milk be cooled down to 86 or 88 degrees Fahr. prior to the rennet being added. It is almost impossible to properly cook a curd obtained from milk which was set at a temperature of 91 degrees or over. In working such a curd there is a big loss in yield, and a weak-bodied inferior cheese is the result.

The amount of rennet required to give a good coagulation is the same in pasteurized and unpasteurized milk. It should be emphasized that in either case a good clean-flavoured starter, with efficient vitality in it, is essential for making cheese. It is more necessary in pasteurized milk, as in the pasteurizing process most of the bacteria are killed, so leaving a clean field for the starter, when added, to take full charge. Therefore over-ripe starters should never be used, for they are certain to produce slow-working curds and an open-bodied cheese. Successful cheesemakers find it necessary to have a new culture about every four weeks. With a good culture, from ½ to 1 per cent. has been found quite sufficient to add to the milk.

A complete plant consists of a milk-receiving vat, a regenerator, two pumps, and a large cooler; these would require a floor space from 12 to 14 feet wide and 20 feet in length. Where there is no well water for cooling the milk down to setting temperature it would be necessary to install a refrigerator plant at extra cost.

The tank supplying water for the cooler should be placed about 5 feet higher than the top of the cooler, so that a supply of fresh water would be ensured whenever required.

The approximate cost of installing a plant without a refrigerator, capable of dealing with 1,800 gallons per hour, was found to be about £400 in New Zealand.

The value of pasteurization cannot be too strongly urged upon farmers selling milk to cheese factories, for unless clean sound milk be supplied, under no system of manufacture can the highest-quality cheese be produced.

ECHUCA WEST CHILDREN'S CALF CLUB.

Report on the Second Year's Competition.

By A. Stephen, Dairy Supervisor.

In a report on the inaugural show and competition of the above club last year reference was made to the large measure of success which met the committee's efforts. The club is now to be further congratulated on the distinct all-round advance observable in the display this year.

The judging took place in the grounds of the local State school, where an arena on orthodox show-ring lines was provided, in which the calves were paraded by their child owners, and from the ringside the proceedings were followed with considerable interest by a large gathering of district residents.

The Leading Calves, with their Owners.

The calves were chiefly grades of the Shorthorn, Friesian, and Jersey breeds, and among the 26 exhibits were many examples of promising dairy type. The winner was a well-developed vigorous Friesian-Jersey, sired by Mr. H. Allez's pure Friesian bull. (This bull, by the way, is begetting promising stock, and several heifers in the owner's herd are in the Standard Herd Test.) Two typical Jersey-grade calves were equal for second place, both sired by pure-bred bulls, and two Shorthorn grades were equal for third position.

The fine condition and development of the majority of the exhibits were a most satisfactory feature, especially in consideration of the fact that all calves competing were born after 1st August, 1924; therefore, on judging day—28th March—all were under eight months old, and a number were under six months. Further, a rule of the club forbids the feeding of concentrates.

The committee, of course, recognizes how essential it is that young calves—and for that matter any young animal—should receive in its unaltered form, during the first few weeks of its existence, the food intended for it by nature, and, therefore, enjoins that whole milk be fed for the first fourteen days, part whole and part skimmed milk for the next seven days, and thereafter skimmed milk alone.

The object of the rule is to place all the children on terms of equality regarding food supply, the resources of each farm being practically similar, and in the irrigation area there was no lack of fresh green lucerne and other pasture during the six months before judging took place.

One of the conditions of judging is that points shall be allotted by the judge to every exhibit, under four headings. Hereunder are details of awards in the last competition.

Owner.	Development.	Type.	Grooming.	Ring Behaviour.	Total.
Maximum Points	**40**	**30**	**15**	**15**	**100**
Ray Williamson	38	28	14	14	94
Gladys Kelton	37	28	14	14	93
Vera Bremner	37	28	14	14	93
Vernon Yeaman	36	27	14	14	91
Harry Arnold	37	26	14	14	91
Vera Letts	36	26	13	14	89
Daphne Bremner	36	27	12	14	89
Tom Riddell	35	26	13	14	88
Leslie Yeaman	37	26	13	12	88
Emily Brown	36	26	12	14	88
Lily Williamson	36	26	12	14	88
Frank Yeaman	36	25	12	14	87
Hector Ritchie	34	27	12	14	87
Cliff Smith	35	26	12	14	87
Angus Riddell	35	26	13	12	86
Jim Letts	34	25	13	14	86
Leslie Brown	35	26	12	13	86
Violet Brown	34	26	12	14	86
Hazel Bremner	34	26	12	14	86
Edie Brown	35	25	12	14	86
Jack Letts	34	25	12	14	85
Keith McRae	35	23	13	14	85
Andy Ritchie	34	26	11	14	85
Lorna Neale	33	25	12	13	83
Bob Letts	34	25	12	12	83
Keir Yeaman	33	24	13	12	82

As a reward each child received a cash prize. This was worked out on a unitary basis, and the leading five received 1½d. per point and the others 1¼d. per point.

As stated in a former report, the club's object is to instil in children a desire to excel, and to quote Mr. Allez, the club's first president, "There are many who have not the advantage of early training in the fundamentals of their callings, and it is desired to teach the children those methods which science and experience show to be correct; we want our children to become skilful men and women in the discernment of dairy quality and in breeding on those lines which made for increased production."

The encouragement given the children may well provide the spark to fire ambition and determine their life's career. It has succeeded in arousing the enthusiasm and proving the capacity of the competitors, as well as arresting the attention of parents and others.

The club now proposes to create a class for pure-bred calves, and in this class to hold the children's interest to the productive stage.

It is gratifying to record that a breeder present, from another district, was greatly impressed with the possibilities of such a club, and offered a pure-bred calf from registered parents as a gift to the club. It is hoped that the lead so spontaneously given will be emulated by other breeders of pure-bred dairy stock, and so help to raise the movement to a higher plane.

Notwithstanding that the Calf Club has to a large extent achieved its original purpose, much valuable work remains to be done. Competitors should be induced to retain possession of their calves, and to note their growth and development, until in due time the first lactation period is entered upon. Then, by having a local testing scheme in operation, the children will be able to see which animal is of most value for a dairy herd. In this way their interest will be further stimulated, and the Calf Club may establish a claim to be a force for the advancement of dairying in Victoria.

A VALUABLE HERD TEST COW.

By H. W. Budd, Dairy Supervisor.

The Government Herd Test has been the means of discovering several cows, at one time regarded as being below average value for dairy purposes, which, on being tested, were proved to be the best members of their respective herds. A very interesting case is that of the pure-bred Jersey cow Midnight, of Clover Flat, now owned by Mr. Edward Day, of Penshurst. She was bred by Mr. D. G. Tomkins, of Coleraine, and was purchased from him by Mr. T. Tobin, of Penshurst, who wanted a pure-bred Jersey as a house cow. Eventually she was placed in the local market, where the highest bid made for her was £12 10s., and she was passed in at that figure. A few days later, however, Mr. Tobin disposed of her privately to Mr. Day, and must have regretted that he had not accepted the offer made at the sale, for the amount paid for her by Mr. Day was only £9.

On the 17th May, 1924, Midnight, of Clover Flat, was entered in the Standard Herd Test, and completed her 273 days term with a total of 445½ lb. to her credit. Hereunder are details of her record:—

—	Milk.	Test.	—
1924—	lb.		
June	957	4·77	45·65
July	900	4·73	42·57
August ..	870	5·56	48·37
September ..	915	5·23	47·85
October ..	915	5·51	50·23
November ..	855	5·9	50·45
December ..	1,035	5·28	54·65
1925—			
January ..	900	5·60	50·40
February ..	973	5·59	55·36
	Total milk 8,320	Average test 5·35	Total butter fat 445·53

Feeding Methods.

During the first four months of her test, Midnight received the following daily ration:—

Oaten hay chaff—10 lb.
Bran—3 lb.
Crushed oats—2 lb.

She, however, did not seem satisfied with her feed, for she took about two hours over each meal. Just at this time, Mr. Day happened to read in this *Journal* an article on "Mineral Matter in Cattle Foods,"*

Midnight of Clover Flat.

(Taken three months after completion of test.)

and this led him to vary the ingredients of the cow's feed. From that time her daily ration consisted of:—

Oaten hay chaff—8 lb.
Bran—3 lb.
Pollard—2 lb.
Pollyfeed (from maize)—2 lb.

and there was mixed with the bulk feed—

Bone meal—2 oz.
Common salt—2 oz.
Slacked lime—2oz.

and once a month she was given ½ lb. of Epsom salts.

At once the cow began to relish her feed more, and ate it in less than half the time she spent on the feed made up as formerly. Her

* By A. J. Gill, Dairy Supervisor, *Journal of Agriculture*, October, 1924.

general health also improved, showing that there was something lacking from her previous food supply. The change was continued to the end of the test, and it is interesting to note that with the change Midnight's butter-fat production improved, and Mr. Day is quite convinced that had she been fed from the beginning as she was from October, her nine months' record would have been better.

The following table shows the cost of keeping this cow during the nine months she was under test, and the amount derived during the same period from her yield of butter-fat, &c.:—

Receipts.	£	s.	d.	Expenditure.	£	s.	d.
445½ lb. butter-fat at 1s. 6d. per lb.	33	8	3	1 ton chaff	3	0	0
723 gallons skim milk at 2d. per gallon	6	0	6	Maize meal	1	19	0
				82 bushels bran	6	3	0
				9 bushels pollard	0	16	0
				2 bags oats	0	18	0
				Epsom salts	0	2	6
				Common salt	0	2	6
				Lime	0	0	6
				Bonemeal	0	2	6
				Grazing	1	16	0
				Interest on land	1	5	0
				Interest on purchase of cow	0	6	0
				Labour for milking	2	8	0
					18	19	0
				Profit balance	20	9	9
	£39	8	9		£39	8	6

A BOOK ON APPLE GROWING.

The comprehensive series of articles on apple culture in Victoria contributed to this *Journal* some time since by Mr. J. Farrell, Orchard Supervisor, has now been issued in book form. The volume is one that will be of great use to any one just beginning in orchard work, but it is not for the beginner only. The question of pollination, the importance of which is not appreciated by many experienced orchardists, is fully dealt with, as is the subject of drainage and the management of orchard soils. Over seventy pages of the book are devoted to pruning, the method of dealing with each of the more common varieties being discussed in detail.

The price of the book is:—Cloth-bound 3s. 6d. (posted, 3s. 9d.); paper-bound 2s. 6d. (posted, 2s. 8d.). Copies are obtainable from the Department of Agriculture.

COOL STORAGE OF WASHINGTON NAVEL ORANGES.

Results of Recent Experiments.

By J. E. Harrison, B. Ag. Sc., Science Field Officer.

Experiments in the storage of Washington Navel oranges were continued this season, with the object of checking and extending investigations previously made, the results of which were published in this *Journal* for May, 1923, and October, 1924. The limiting factor in the storage of oranges is the development of mould upon the fruit, and the object of experiments at this stage is to demonstrate, for the guidance of growers and cool storemen, those conditions which retard or develop the growth of mould in storage. The conditions may, in some instances, be controlled in the field and during transit, that is, before storage, while in others the control is obtainable in the store itself. It rests with the grower, for example, to pick, sweat, grade, wrap, and pack and transport his fruit in a dry condition and without injury to the skin, while the responsibility of keeping the fruit dry and holding it constantly at the most satisfactory temperature lies with the storemen. On the other hand, there are qualities of the fruit itself which may in part govern its life in storage, e.g., the percentage of sugar, the texture of the skin, and the size of the fruit. The conditions of soil and climate, the origin of stock and scion, and any other factors which may influence these characters are not well understood, but it is possible without this knowledge for a grower to have that sense of quality and constitution which mark an orange suitable for long storage, and his success in storage will depend largely upon his powers in selecting and handling his fruit.

Experiments to test the value of sweating were continued; but, unfortunately, were complicated by differences in the size of the fruit used. Following are tables (I. and II.) giving the results of storing oranges, sweated and unsweated, in chambers refrigerated by a combination of the direct expansion and air-circulation systems.

TABLE I.—WASHINGTON NAVEL ORANGES FROM COBRAM.

No. of Fruit in Case.	Temperature.	Treatment.	10 Weeks' Storage.		14 Weeks' Storage.	
			Per cent. Mould.	Per cent. Sound.	Per cent. Mould.	Per cent. Sound.
84	38 deg.	Sweated ..	24	76	47	53
75	38 „	Unsweated	40	60	100	..

NOTE.—The percentages given for 14 weeks' storage refer to the fruit remaining sound after 10 weeks' storage.

Sweating of the fruit was carried out at about 70 degrees in a special box drier at the Government Cool Stores upon its arrival there, the process being continued until the skin was pliable and velvety to the touch.

During sweating 8 per cent. of fruit was lost through mould development, and this loss must be added to the figures shown in Table I. Were sweating carried out by the grower immediately after picking, the amount of mould should be greatly reduced.

TABLE II.—WASHINGTON NAVEL ORANGES FROM BAMAWM.

No. of Fruit in Case.	Temperature.	Treatment.	10 Weeks' Storage.		14 Weeks' Storage.	
			Per cent. Mould.	Per cent. Sound.	Per cent. Mould.	Per cent. Sound.
112	34 deg.	Sweated ..	..	100	13	87
75	34 „	Unsweated	..	100	50	50
96	38 „	Sweated ..	1	99	41	59
84	38 „	Unsweated	16	84	61	39

NOTE.—Two per cent. of fruit was lost during the process of sweating.

Even though the fruit differed in size, we regard both tables as significant of the effect of sweating in retarding the development of mould.

The influence of wrapping upon mould development was again tested by experiment with fruit from Riverside and Bamawm. No particular advantage or disadvantage can be claimed this year as far as wrapping in its relation to mould development is concerned, but the improvement in the appearance of wrapped fruit should add to its commercial value. The following table sets out the results obtained with wrapped and unwrapped fruit stored at different temperatures for fourteen weeks:—

TABLE III.—WASHINGTON NAVEL ORANGES FROM RIVERSIDE.

No. in Case.	Treatment.	Temperature Deg. F.	Mould.	Free from Mould.
105	Wrapped..	32 deg.	2	50 or 96%
140	Unwrapped	32 „	..	140 or 100%
105	Wrapped..	34 „	3	102 or 97%
105	Unwrapped	34 „	..	105 or 100%
140	Wrapped..	38 „	22	111 or 83%
105	Unwrapped	38 „	14	73 or 84%

No mould was observed in unwrapped fruit after ten weeks' storage, except in the case stored at 38 degrees, where two mouldy oranges were found. The wrapped fruit was not disturbed. A second examination was made four weeks later, with the result set out in the above table. In this last experiment, as in the previous one (Table II.), no evidence in favour of wrapping as a preventative of mould is disclosed. It is worthy of mention as regards size that the largest oranges in each case usually made up the bulk of the fruit infected.

Two cases of oranges from Bamawm, each containing the same number (112), were stored together at 34 degrees, one case wrapped and one

sweated. The following table gives the results after fourteen weeks' storage:—

TABLE IV.—WASHINGTON NAVEL ORANGES FROM BAMAWM.

	Mould.	Free from Mould.	Per cent. Free from Mould.
Sweated	15	95	86
Wrapped	58	50	46

NOTE.—Two per cent. of fruit was lost during process of sweating.

The deterrent effect of sweating, as compared with that of wrapping, upon the occurrence of mould appears very evident from this table.

A small experiment was made with oranges from Cobram to test the deterrent or fungicidal properties of chinosol, a trade preparation, upon oranges dipped in a solution of 1 in 1,000 of this substance, and afterwards dried and stored. Separated milk powder at the rate of 100 gms. in 1 litre of water was used as a spreader in which the chinosol was dissolved. One case of oranges was taken; one-half was dipped and dried and the other half left untreated. Both lots were then stored together at 38 degrees in the same chamber, and examined on two occasions at the end of four and eight weeks respectively.

TABLE V.—RESULTS OF TREATING ORANGES WITH CHINOSOL.

Treatment.	After Four Weeks.		After Eight Weeks.	
	Mouldy.	Free from Mould.	Mouldy.	Free from Mould.
Treated	5	41	13	28
Untreated	8	40	16	24

No definite control or deterrent effect is apparent from the table, but the method suggests possibilities with other substances. Our experience so far, however, points definitely towards the process of sweating as offering the best means for minimising the development of mould in cold storage.

An interesting phenomenon occurred in the freezing of oranges from different districts, viz., Cobram and Riverside. Various lots from each district were stored in a direct expansion chamber at an average temperature of 32 degrees F., fluctuations of 2 degrees F. from the average being likely to occur. After ten weeks storage, both lots were examined, with the result that the Riverside fruit was found to be sound and in good order, while numbers of the Cobram fruit were soft and tasted like orange marmalade. Freezing was suspected, because of a gritty substance noticeable on tasting the fruit but soon disappearing, and with the aid of a hand lens minute ice crystals were easily found. The freezing had evidently destroyed the cell structure of both the flesh and the rind, and diffusion of the juices of the rind and the flesh had taken place, imparting to the latter the flavour of marmalade. The juice of twelve sound representative oranges of each lot was submitted to the

Chemist for Agriculture, Mr. P. Rankin Scott, for analysis. The result of the analysis is shown in the following table:—

TABLE VI.—ANALYSIS OF JUICE OF ORANGES FROM RIVERSIDE AND COBRAM.

	Riverside.	Cobram.
Specific gravity	1·0403	1·0392
Total solids	9·60%	9·46%
Acidity (as citric acid)	0·69%	0·64%
Reducing sugars (as invert sugar)	4·43%	3·11%
Freezing point	1·445°C	1·01°C

The twelve Cobram oranges were selected from the cases in which freezing had occurred, and it is assumed that an analysis of the juice of sound oranges gave a fair comparative analysis between the unfrozen Riverside fruit and the frozen Cobram fruit. If this assumption be reasonable, then the difference in the freezing points of the two juices indicates plainly the reason for the freezing of some of the Cobram fruit and why the Riverside fruit did not freeze. An examination of both lots four weeks later, however, showed that practically all the Cobram oranges had frozen, and evidently because of a fluctuation below the freezing point of the juice of the Riverside oranges, some of these had frozen too.

The practical importance of all this points towards a limit in temperature below which it should not be attempted to store oranges, particularly in commercial cool stores where more pronounced fluctuations are likely to occur.

By reference to Tables I. to IV. a comparison between the keeping qualities of oranges from different districts is again possible, and supports previous results (see this *Journal*, October, 1924, page 585). Riverside fruit held up better in storage than Cobram fruit, while Bamawm fruit maintained an intermediate position. Experimental evidence of this nature should lead the various Citrus Associations concerned to encourage the sale of fruit at picking time from some districts, and the storage of that from other districts. This would not only distribute the sale of fruit over a longer period, but would minimize the total loss to the growers as a body and to the State generally.

The influence of temperature upon mould development is illustrated by the following table:—

TABLE VII.—SHOWING INFLUENCE OF TEMPERATURE UPON MOULD DEVELOPMENT.

District.	No. of Fruit.	Temperature.	Length of Storage.	Mould.	Sound.
Bamawm	84	30 deg. F.	10 weeks	..	84
			14 weeks	1	83*
,, ...	84	38 deg. F.	10 weeks	13	69
			14 weeks	40	26
Riverside	105	34 deg. F.	10 weeks	..	105
			14 weeks	..	105
,, ...	105	38 deg. F.	10 weeks	2	103
			14 weeks	14	73

* NOTE.—Many fruits were frozen at this temperature.

It will be seen that in both Riverside and Bamawm fruit the development of mould was greater at the higher temperature, a result confirming previous investigations. It is of interest to note the increased percentage of mould after fourteen weeks' storage as compared with ten weeks' storage, and suggests that, if stored without delay after picking, fruit susceptible to mould development could be kept for several weeks with reasonable safety.

The year's experiments may be considered to emphasize the following points:—

(*a*) That the process of sweating offers the best means to date of minimizing the outbreak of mould in cool storage.

(*b*) That, owing to fluctuations, an average temperature of 32 degrees F. is unsuitable because of the danger of freezing.

(*c*) That an average temperature of 34 degrees F. will avoid the danger of freezing and give less mould development than at higher temperatures. 34 degrees F. is, therefore, recommended as the most satisfactory temperature of storage.

(*d*) That fruit from different districts varies in keeping quality.

VINE BLACK SPOT AND ERINOSE.

By F. de Castella, Government Viticulturist.

Among the few vine diseases amenable to winter treatment are two which merit the immediate attention of our vine-growers.

The first of these is Anthracnose, or Vine Black Spot, which, as the result of last year's weather conditions, threatens, in the absence of adequate precautionary measures, to become disastrously prevalent.

The second is Erinose, a disease of far less importance, but which, in some localities, has multiplied to a quite alarming extent. In a few cases, the injury wrought by this usually harmless mite has been such as to necessitate the application of treatment.

ANTHRACNOSE OR VINE BLACK SPOT.

The outbreak of 1917-18, which so disastrously reduced the 1918 sultana vintage, will be still remembered in Mildura. The main object of the present article is to warn growers of sultanas and other susceptible sorts of the imminence of a visitation of similar nature during the coming spring. Such a disaster is quite preventable, and it is hoped that timely warning may result in the application of the control measures necessary to ensure safety.

Though the number of vineyards which suffered severe injury last season may not be considerable, Anthracnose was every where in evidence. Scars, mostly of small size, are widely present on almost all sultanas and other susceptible vines. Foci, or starting points, are thus exceedingly numerous and widely disseminated throughout our vineyards. Two factors only are needed for the occurrence of an outbreak of unusual gravity. These are—

(*a*) Suitable weather conditions for the fungus.

(*b*) Absence of efficient control.

Weather Conditions.

In the event of the coming spring being a dry one, no harm will result—the fungus will be unable to make a start, no matter how numerous the latent starting points may be. Unfortunately, we can place no reliance on a dry spring—to do so would mean gambling on the weather, the worst form of improvidence.

A spring suited to fungous development would inevitably lead to disaster in undefended sultana vineyards. Such a spring need not necessarily be a very wet one. Occasional showers, and even heavy dews, at not too far distant intervals, when the vines are sprouting and for a few weeks afterwards, are all that the Anthracnose fungus needs.

Efficient Control.

Details cannot be gone into here. A full description of Anthracnose (*Manginia ampelina* V. & P.), its life history, and its control, will be found in Bulletin No. 42, "Anthracnose or Black Spot of the Vine," a copy of which will be forwarded post free, on application to the Director of Agriculture, Agricultural Department, Melbourne.

It will suffice to here recall that, for adequate protection, treatment must be twofold, consisting of (*a*) the winter swab, with acid iron-sulphate solution; and (*b*) spring and summer sprayings with copper fungicides, such as Bordeaux, &c.

We have ample proof that this complete treatment can adequately protect the vine, even in a wet season. The danger lies in incomplete treatment; in the too common tendency to rely entirely on spring and summer spraying, and to discard the swab. It is true that protection *can* thus be secured; but in a bad Black Spot season, repeated, in fact almost continuous, spraying is needed from the moment the vines sprout. The spores of the Black Spot fungus seem to show rather more tolerance for copper than those of Downy Mildew, the germinating zoospores of which are extraordinarily sensitive to traces of copper.

Well-advised growers regard such spraying as supplementary only, to the swab, which has for many years been regarded, and correctly so, as the sheet anchor of Black Spot control.*

The Swab.

The modified swab (iron sulphate, 20 lb.; sulphuric acid, 8lb. by weight; and hot water, 10 gallons) seems to be of ample strength. It is more convenient than the older formula with 35 lb. of iron sulphate, which deposits crystals on cooling. It can be applied with brush or mop, or by means of a special spray pump.

The swab is admittedly messy and unpleasant to handle; it damages clothes and boots, and is severe on spray pumps, &c. It is for these reasons that it is unpopular in some quarters.

* The extra strong Bordeaux (5 lbs. copper sulphate, 5 lbs. lime, and 10 gallons of water) applied to the sprouting vines (see *Bulletin*, No. 42, p. 26), seems worthy of more extensive application. It proved satisfactory at the Ruthergien Viticultural Station, where its application was supplementary to swabbing. Prepared with pure, fresh quicklime, leaf scald was only trifling.

On the other hand, it is wonderfully effective. On properly swabbed vines, the appearance of scars in early spring is almost entirely suppressed, and the clean start the vines get is in marked contrast to neighbouring vineyards where the treatment was omitted. The swab may, and often does, need supplementing by copper sprays—it cannot be expected to destroy the totality of the wintering forms. In a wet spring, the few survivors will supply fresh infection, in limited quantity at first. This must be promptly dealt with by means of copper sprays. On vines which were badly affected last season, the double swab, i.e., the repetition of the application after a lapse of a fortnight, is to be recommended. (*See* Bulletin 42, p. 26.)

It can be confidently affirmed that never was swabbing so imperatively demanded as this winter. Any grower of susceptible varieties who decided to dispense with it is taking very grave risks.

ERINOSE.

In Erinose we have a very much less redoubtable foe than Anthracnose. It will, indeed, surprise many growers familiar with this usually harmless pest that any serious notice should be taken of it. Nevertheless, in a few cases, Erinose attacked vines last season with sufficient intensity to cause injury to the crop, and to prove that, under Victorian conditions, it is not always as inoffensive as it has hitherto been considered.

In many parts of the State, Erinose is as yet unknown; a brief description is, therefore, not out of place.

The vine disease known by this name is caused by a minute acarian or mite, *Phytoptus Vitis,* rather closely allied to the pear phytoptus, so small as to be only visible under the microscope. The outward appearance is graphically described by the common name "Warty Leaf" recently applied to it. Numerous hollow warts or blisters are formed on the leaves as the result of irritation caused by the mites. These are convex above and filled on the lower concave side with a felt-like down, which at one time led to the belief that the affection was of fungous nature. This down is glistening white at first, but later becomes reddish, and ultimately brown.

In Victoria, Erinose was first observed at Rutherglen in 1910. It has appeared within the past few years at Merbein, Nyah, and at different points in the Goulburn Valley. It has long been known in Europe, and is very common in the vineyards of the south of France. It is generally considered to be perfectly harmless, in spite of its decidedly alarming appearance, especially when seen for the first time. In French text-books, little notice is taken of it, though exceptional cases are mentioned of injury to the foliage of young vines.

Likewise in Rutherglen, though plentiful throughout the district for some fifteen years, no injury to the vine or its fruit has, so far, been reported. It was, therefore, with some astonishment that the writer received, last summer, complaints from growers at Nyah and

Kyabram to the effect that serious damage was being caused to their vines by this hitherto inoffensive mite. Inspection proved the correctness of these reports.

At Nyah, more particularly, a few blocks were attacked with an intensity not previously observed in this State. On the worst patches, every leaf was blistered and deformed, foliage injury being such as to interfere seriously with the ripening of the grapes. It is true that the outbreak was patchy in a marked degree, being limited to a few blocks or portions of blocks. The damage done to the district as a whole was insignificant. Erinose spreads slowly. On patches badly affected this year, its presence had been observed for some seasons previously without any harm having resulted. It seems to be spreading steadily, and to constitute a new vine pest with which we must reckon in the future. Among vine varieties grown at Nyah, Gordo Blanco Muscat, and Doradillo suffered most. Zante Currant was affected to a lesser extent; whilst Sultana suffered only trifling injury.

As Regards Control.—French text-books recommend sulphuring, in the same way as for Oidium, in the rare cases where Erinose may be unusually plentiful. Phytoptus, like all mites, is very susceptible to sulphur. It must be here noted, however, that in one case at Nyah, sulphuring (two applications) was tried with negative result. Possibly it was not applied early enough, as these vines were badly affected from sprouting time. Lime-sulphur, 1 in 40, sprayed in September, when the vines were sprouting, gave better results, though protection was not complete.

Winter treatment promises better results. Swabbing with acid iron-sulphate solution, so strongly recommended against Black Spot, seems to destroy the hibernating mites. Its efficacy was demonstrated in one Nyah vineyard last season. A Gordo block, swabbed at the end of last winter, was quite free from Erinose, which was fairly plentiful on some adjoining Zante currants which had not received similar treatment.

Lime-sulphur (winter strength—1 in 12) also seems effective. A vineyard at Shepparton East, where Erinose was plentiful during the 1923-24 season, was sprayed, after pruning, with lime-sulphur. During the past season, it was difficult to find an affected leaf.

Growers are urged not to neglect this new-comer, more particularly in irrigation districts, where it has appeared with an intensity unknown in non-irrigated vineyards. Wherever Erinose was abundant last season, precautionary measures should be taken before the coming spring, either in the shape of swabbing with acid iron-sulphate solution (as for Black Spot), or of spraying with lime-sulphur, 1 in 20. On the worst affected patches it might, indeed, be well to duplicate the treatment, the lime-sulphur spray being applied after pruning, and the swab at the usual time, just before the buds burst.

Simultaneous control of Anthracnose and Erinose will sometimes be possible—in the case of Gordo Blanco, for example. Though not so susceptible as Sultanas, Gordos sometimes suffer severely from Anthracnose. With a severe outbreak imminent, the swabbing of Gordos is certainly desirable. It will, at the same time, protect against Erinose in vineyards where it has obtained a foothold.

THE BLUE MOULD (PERONOSPORA) DISEASE OF TOBACCO.

By D. B. Adam, B. Agr. Sc., Plant Pathologist.

Tobacco is one of the minor agricultural crops in Victoria. In 1895, over 2,000 acres were devoted to its cultivation, but in 1917-8 the area had fallen to less than 100 acres. Since then it has increased, so that now there are about 1,000 acres set out to tobacco. The fluctuation of this acreage has, in the past, been governed mainly by the price of local leaf, and now future expansion is threatened by the *peronospora* disease, commonly called "Blue Mould."

Frequently, a tobacco seed-bed, containing thousands of plants in a condition ready for planting out, is ravaged to such an extent that every plant is affected. Growers, in the past, by cultivating a large number of seed-beds in different parts, especially in the hills, sought to avoid disease in some beds, and usually from these sufficient plants could be obtained for planting-out purposes. A more serious problem has arisen lately in that the disease is not confined to the seed-bed, and quite large areas of planted-out tobacco in various stages of maturity have been ruined by it.

Distribution.

The *peronospora* disease affects the cultivated tobacco (*Nicotiana Tabacum* L.) in each of the tobacco-growing areas in this State, and it has also been observed in other States of the Commonwealth. This same fungus occurs on the native tobacco—*Nicotiana suaveolens* Lehm.* —but it has not been discovered yet on the smooth-leaved tree tobacco—*N. glauca* Grah.† From growers' statements it appears that during the first season in a new district there is little or no *peronospora* disease, but that in subsequent seasons it becomes much more prevalent.

A fungus (*Peronospora* sp.) is invariably associated with this disease. Numerous experiments have been carried out wherein the spores, which in a fungus correspond to the seeds of tobacco or of other higher plants, have been placed on the leaf of a sound plant. Under suitable conditions of heat and moisture the fungus develops in the leaf of the plant, and eventually produces violet-coloured downy spots on the underside of the leaf. The spots consist of large masses of spores. The method of production of these spores and their structure show that the same fungus that was used for inoculation purposes is reproduced.

At the same time as these experiments were carried out, other sound plants treated similarly to the above, except that they were not inoculated, remained free from disease throughout.

It is hoped that a detailed description of the disease and fungus concerned, together with other information of scientific interest, will be published later.

* D. McAlpine. Report of Vict. Plant Pathologist 1899.
† W. G. Farlow. *Abs. Bot. Gazette*, 10, p. 246.

The following is a brief account of some experimental work carried out in the field last season:—

Spraying and Manurial Tests.

Plots of tobacco, variety Hester, were set out at Wahgunyah on 4th October; these plots were covered with straw for three weeks, when the straw was replaced by hessian. The weather during this period was cold, and the plants did not grow vigorously. On 28th October, "Blue Mould" broke out in older beds, about 200 yards away from these experimental plots; three days later the plots were sprayed. The plots set out were treated manurially along their length as follows:—

1. No manure.
2. Superphosphate.
3. Superphosphate and sulphate of potash.
4. Superphosphate, sulphate of potash, and nitrate of soda.
5. Ground limestone.
6. Sulphate of potash.
7. Nitrate of soda.
8. Magnesium sulphate.
9. Iron sulphate.
10. Sulphur.
11. No manure.

The following sprays were used on plots superimposed at right angles to the manurial plots:—

1. Copper soda—6.9.50.
2. Bordeaux mixture (alkaline)—6.4.50.
3. No spray.
4. Copper carbonate powder (dusted).
5. Lime sulphur.

They were sprayed twice subsequently, at 5-day and 12-day intervals, but no special effort was made to reach the underside of the leaves of the plants, which leaves at this time were only from ¼ inch to ½ inch in diameter, and very close to the ground.

Plants in all these plots developed a good deal of *peronospora* disease. The plots sprayed with Bordeaux mixture were slightly more healthy in appearance than the others, but still contained a number of diseased plants.

None of the manurial treatments above mentioned affected to any noticeable degree the incidence of the disease.

This experiment does not necessarily prove that sprays are inefficacious under all circumstances, but shows that their usefulness, if any, is limited. Under the conditions of the experiment, as described above, certain plants might have been affected without showing any symptoms. It appears, however, that to anticipate the disease spraying would need to commence very early, and be kept up; and this treatment, from appearances last season, may affect the health of the plants.

Resistant Plant.

With a view to isolating a blue-mould-disease-resistant strain of tobacco, 34 different varieties and selections, reputed by the different suppliers to be "blue mould" resistant, were sown in plots about 5 feet x 3 feet. This whole area was covered with cheese-cloth supported on a permanently erected frame. The plants in all the plots grew well,

although the leaves were lighter green and much softer in appearance than those of plants grown in the open. On 12th November, when the majority had three or four fair-sized leaves, the plants were inoculated. A week before "blue mould" had broken out, and had been observed in beds 200 yards distance away. While plants in the shed appeared healthy and sound, no particular effort to determine this fact was made. Inoculation was effected with a liquor made by shaking up badly affected tobacco leaves with tap water. This liquor was decanted off and applied to the plants as a fine spray with a clean pump. Very good infection was secured, the plants being in such a susceptible condition that whole plots became diseased. On 25th November, a second inoculation was effected. As the weather now became warm and dry, the plots were heavily watered each day to maintain as favorable conditions as possible for the disease. On 8th December, the plots were again examined, and any plant that showed a diseased spot was removed. In this way only five plants were left in the shed; two of these had been the most vigorous growers throughout the growing period. These five plants were allowed to grow to maturity on the spot, the flower stalks being covered with cheese-cloth. This, by addition to the screen protection, prevented any possible cross-pollination. All of these plants before harvesting showed one or two spots of "blue mould," proving that they did not possess any power of absolute resistance to the disease. At maturity the heads were harvested and kept separate. The seed obtained will be sown again this season, and the seedlings subjected to similar treatment to that given last year.

A parallel experiment to the above was carried out at Burnley, the seed being sown on 20th October. The weather for six weeks subsequently was cold and wet, and the seedlings made very poor growth. On 15th December they were still considered too small to inoculate. At the next examination, on 31st December, though no artificial inoculation was made, "blue mould" was epidemic in the enclosure. On 5th January the plants were inoculated in the manner described previously.

Subsequently all plants showing any degree of infection were cut out; this resulted in four plants being left to grow to maturity. The experiment at Burnley, on account of a poor growing season, was not as satisfactory as that at Wahgunyah. The seed from these plants, however, will be used this year, and selection by the same method applied.

During the season some observations worthy of record were made; they form the basis of laboratory experimental work at present in hand.

The Importance and Role of the Oospore.

An oospore is a thick-walled fruiting body or seed produced within the tissue of the host plant by fungal parasites of the type to which the blue mould fungus belongs. From its structure the oospore, or resting spore, is able to retain its vitality for quite long periods. In this regard it is distinct from the short-lived conidia, or summer spores, previously mentioned as constituting part of the familiar, violet, downy patches characteristic of the disease.

Oospores have been discovered in affected leaves of cultivated tobacco, though the occasions on which they have been found are rare. This may not reflect the case in nature, since possibly we are ignorant of the best conditions for their production within affected leaves.

From analogy with other similar diseases, the practice of establishing beds only in new ground to avoid disease is, therefore, commendable.

During last season, on two distinct occasions, "damping-off" disease occurred among tobacco seedlings being raised for experimental purposes. On 18th August, 1924, some small seedlings, planted, in a 12-in. shallow pot, in fresh clean soil, and grown under atmospheric conditions, "damped off" in circular patches. The horticulturist raising these seedlings thought this disease was simply "damping off," due to excessive watering, and the disease was not reported until it was too late to determine with certainty its cause. On 22nd April, 1925, another pot with tobacco sown on 11th March, 1925, "damped off," and the "blue mould" fungus was isolated from the affected plants. This pot had been kept continually under glass, and the fresh soil used was watered overhead with a watering can, tap water being used. The season at this time was dry, and no freshly-produced conidia were present on two small tobacco plants in a cheese-cloth enclosure 300 yards away, and this was in an area where no tobacco is grown commercially, and was the nearest possible source of infection. Under these circumstances the chance of conidial infection was very remote.

These observations indicate an important source of infection carried with the seed itself or with the chaff associated with the seed. We have, in fact, discovered what appeared to be resting spores in pieces of the bract (chaff) present in the inflorescence (seed heads) of the tobacco plants. These pieces, in harvesting, pass into the seed sample. The proof of infection from this source is an important matter which is to be given attention.*

While the evidence is far from complete, it justifies, at this stage, a recommendation that all seed samples should be cleaned free from chaff before sowing, a procedure at present neglected, but one which would not be difficult and is very well worth while.

Several affected plants have been observed to produce the conidia (summer spores) off and on throughout the season, as long as the tobacco plant remained alive. In a mild autumn and winter, such as existed last season, conidia may be produced right through the winter. Doubtlessly in this way the disease is carried over from one season to another. It is absolutely essential that there should be complete destruction of all old tobacco stalks at least one month before the earliest sown tobacco has germinated, so that this source of infection may be minimized as much as possible.

The particular species of *peronospora* associated with tobacco blue mould has not been observed on any plant other than the species mentioned earlier—Native tobacco (*N. suaveolens*) and the cultivated tobacco (*N. Tabacum*). Careful, but unavailing, examination of botanically related hosts failed to reveal the presence of the tobacco *peronospora* fungus. Native tobacco does not occur, as far as I know, in the Ovens or King River Valley, the main tobacco-growing area in this State.

Meteorological Data.

There is a close connexion between climatic conditions and the incidence of "blue mould" disease. Data in respect of temperature,

* Wartenweiler (Ann. Mycol. XVI., p. 249).

humidity, and rainfall have been collected at Wahgunyah Experimental Farm and at Buffalo River, the latter through the courtesy of Mr. T. Snowball. This data, with notes on the disease obtained from year to year, will acquire more interest with the passage of time, but nothing useful can be gained from their presentation here.

Summary.

In recapitulation, three important recommendations are made—

1. The continuance of the experiments for raising resistant plants.
2. The necessity of cleaning all seed free from chaff before it is sown.
3. The destruction by fire of all old tobacco plants and refuse in the field as early as possible, but at least a month before the fresh season's beds have commenced to grow.

(Note to Growers.—The first of these recommendations is for attention by the Department, which will be given; the other two are for the growers themselves to attend to in their own interests.—S. S. Cameron, Director of Agriculture.)

CONCRETE POSTS.

By R. T. McKenzie, Senior Dairy Supervisor.

In many districts, owing to their being denuded of timber and to the increased cost of labour and cartage, and to royalties, farmers are finding it difficult to get fencing posts at a reasonable price, and consequently the more progressive are turning their attention to the making of concrete posts.

Mr. J. J. Baker, of "Rosedale," Bannockburn, well known as a breeder of Yorkshire pigs, has during recent years repaired several of his fences with posts made from gravel, sand and cement. In his district split posts cost £1 per 100, exclusive of cartage, and concrete posts can be made on the farm at practically the same price. Besides, not being any more expensive than split posts, they have the advantage of being immune from white ants and fire, and further, if competently made, they will last, one might almost say, for all time. Mr. Baker has erected many chains of fencing with concrete posts, and intends to replace the whole of the wooden posts with concrete ones.

Having had no previous experience to guide him, he made several experiments before he found the best mixture to use and what reinforcement was required. His practise is to set eight posts at a time. The moulds are 6 feet long, but, of course, if desired, could be made longer, and are constructed of 6½-inch flooring boards for the sides and a 4-inch one for the bottom, and the top is neatly trowelled off. The posts when taken out of the mould are 6 feet long and 6 x 4 inches wide. Holes to carry the fencing wire are made by passing a round piece of iron through half-inch holes in the moulds and giving it a few turns occasionally before the concrete sets. The concrete used is made of four parts of gravel, two of clean sand, and one of cement. The gravel is well sieved in order to remove all foreign material. The reinforcement consists of scrap iron from a Geelong foundry, which can be had

for the carting. One bag of cement will make eight posts, so that, apart from the carting of material, they cost approximately 1s. each.

Mr. Baker emphasizes the necessity of thoroughly mixing the material and securely embedding whatever is used for reinforcement. Reinforcement is essential in concrete posts, as it is necessary they should be strong enough to stand a strain in any direction, and much of their strength is acquired from the reinforcement, for while concrete is strong in compression it is weak in tension.

About three days are allowed for the moulding process; the posts are then carefully removed and left on the ground until hardening is completed.

It is some time since the first concrete posts were put in by Mr. Baker, and there is no doubt about their strength. Several have had some severe knocks, and they show no sign of cracking. The fencing certainly has a very attractive appearance. Mr. Baker says that any practical man will find no difficulty in moulding the posts, and a little experience will soon determine the best method of working. There is nothing very complex about reinforced concrete; the fundamental principles are simple, and only common sense is required to understand them.

AUTUMN MORTALITY OF BEES.

By F. R. Beuhne, Government Apiculturist.

Some seasons, at intervals of years, there is heavy mortality of bees in certain districts during the autumn honey flow. This mortality is quite distinct from that of Bee Paralysis, Nosema, and Disappearing trouble, and appears to affect black bees and crosses more than Italians. It occurs chiefly when late in autumn bees are working on grey box (*E. hemiphloia*) and red ironbark (*E. Sideroxylon*).

I do not think, however, that the source of the nectar is responsible, as some apiarists assume, but that it is the condition of the nectar brought about by the climatic influences existing at the time

The first indication of the trouble is an accumulation of dead bees in front of the hives. Closer observation reveals that the returning field bees act abnormally and show distinct symptoms of intoxication. They frequently enter the wrong hive, where they are stung and thrown out; consequently, the trouble is sometimes mistaken for robbing. When the bees return to their own hive in this condition they are set upon by the normal inmates and ejected generally without being stung.

Of scores of bees picked up when returning from the bloom in this condition, not one survived 24 hours. It would, therefore, appear that the bees die of alcoholic poisoning. The reports received from apiarists in different districts indicate that there is a connexion between frosts and the production of alcohol in the blossom of some Eucalypts, and, further, that the blossom of different Eucalypts is not affected alike. In localities where other sources of nectar are available at the time no general loss occurs, although odd hives may be badly affected.

Under normal conditions any bees which die inside the hive are carried out and away from the hive. When, however, the death-rate is considerably in excess, as in the case of robbing, paralysis, and alcoholic poisoning, they are merely dragged out of the entrance and dropped.

The loss of many adult bees, of course, weakens the colony, but, in alcoholic poisoning, the loss is only temporary, and is to some extent made good by increased broodrearing, provided sufficient stores are available.

Microscopical examination shows the affected bees to be quite normal, and no remedy can be suggested; but, as the death of the bees is due to the same causes which operate when honey turns sour in the combs during winter, it is advisable to remove all surplus combs, keep them indoors in a dry place, and return them only as needed by the bees.

FEEDING DRY BUTTERMILK.

An American Experiment.

"There are many large dairies located near the big cities for convenience in disposing of their products, that buy practically all the feed they use. They would not be located there if it were not more economical to be close to the market for the sale of their products. The trade of the dairies putting out their milk direct to the consumers is gradually increasing, and they must of necessity buy certain feeds, in many cases articles they should raise. It can readily be seen that it is far cheaper for them to buy their feeds than it would be to own an expensive farm, plus the cost of running the farm, and then not be able to grow the feeds that will produce the results that manufactured feeds will produce.

The big farmers of the country ship their produce to the terminal markets where a large percentage of goods is made into flour, cereals, and food of all kinds for human consumption. It is remarkable to note the high quality of by-products and the valuable feeds developed from by-products. The interesting part of it is that many of these by-products are richer in food value than the natural grains, seeds, and other products from which they are derived. They are at times cheaper per ton, especially when the demand is heavy for the original products that they are obtained from. The results secured are remarkable, amounting in many cases to 50 per cent. increase in production over the old, one-grain feed, until to-day many high-class manufacturer feeds, on account of quality and price, have been going back to the farm at an advantage to the manufacturer and farmer alike.

About 1914 Professor E. V. McCollum came out with an announcement that a combination of the fat in milk and water of leaves in such leafy plants as alfalfa, added to a balanced feed would greatly add to the assimilation of the feed. The use of milk for the feeding of animals was out of the question on account of the cost, so attention was directed to buttermilk. While buttermilk is considered an excellent feed, it has been hard to obtain, hard to handle, and would not keep, and when the large creameries moved to the big cities, it made it still more difficult for the farmers to obtain buttermilk.

It was quite impossible to move the liquid buttermilk to the farmer at a reasonable cost, so millions of gallons were allowed to go to waste.

One of the most noted and beneficial by-products developed in the past few years is dried buttermilk. This product is dried to a powder

the colour of cream, and contains 30 to 35 per cent. protein, and from 5 to 8 per cent. fat, or five times richer in protein and twice as rich in fat as whole milk. It is totally digestible and rich in vitamines and lactic acid. There is about 92 per cent. water in liquid buttermilk, so you can readily see the remarkable strength in it when reduced to dried form. In this form it will keep indefinitely in any ordinary warehouse, and is easy to handle and ship. It is marketed in bags and barrels much the same as flour and grain. Dried buttermilk when combined with other articles has been, without question, the means of developing more remarkable results in increased weight, and building of baby animals, than anything that has ever been placed on the market.

Six to twelve articles are used in manufactured feeds to secure variety, palatability, digestibility, and the proper chemical analysis, to produce the results desired. From this one can readily see that it would be impossible for a farmer to carry on these developments and make mixtures of feed that would produce results such as can be handled by large manufacturing plants. During my stay in the west I found entire communities where manufactured dairy feeds were unknown, and after the introduction of high-class dairy feed, made as it should be, we were able to show an increase of as high as a gallon of milk per day per cow.

One of the first official tests on the use of dried buttermilk was made by the Indiana State Agricultural College on a two-year test on three pens of thrifty White Leghorn pullets each, and completely backs up my contention of the value of dried buttermilk. The three pens were all fed the same feed, one without buttermilk, one with addition of liquid buttermilk, and one with dried buttermilk.

The accompanying table gives the results.

AVERAGE YEARLY RESULTS.

	Without Buttermilk.	Liquid Buttermilk.	Dried Buttermilk.
Yearly eggs per hen	56·6	164·7	189·4
Pounds feed consumed per year per hen ..	59·1	75·8	76·6
Total cost feed per year per hen	$1·49	$2·16	$2·47
Total cost 1 doz. eggs per cost feed ..	·33	·16	·16
Pounds feed used to produce 1 doz. eggs ..	8·31	3·56	3·22
Income from eggs sold per pen	$2·39	$7·13	$8·21
Profit over cost feeds per pen	·78	4·92	5·69
Mortality during year	High	Low	Low

Many other interesting tests have been made which show results as good as, or even better than, the above. In all cases a well-balanced feed containing five or eight articles, including a small percentage of dried buttermilk, produced the best results.

A Michigan report showed over 90 per cent. of 500 baby chicks successfully raised where the general average before was a loss of at least 80 per cent. An Iowa report showed 15-oz. baby chicks at four weeks. A New Jersey report showed beautifully formed birds, weighing 3¼ lb. in 80 days. A Californian report from a breeder with 45 years' experience in the poultry business showed a 70 per cent. increase in egg production in twenty days. He also reported an increased weight in the eggs to 26 oz. per dozen, and pullet eggs came up from 19 to 22 oz. A

report from a large poultry fattener showed an increase of 40½ lb. on 92 White Leghorn pullets in eight days. This was 22½ lb. more increase on the same number of birds over the feed they had used, and which had apparently given satisfaction. A report from a shipper of live poultry showed a gain of 1,500 lb. on trip of 1,200 miles against previous losses of from 100 to 300 lb. when fed corn alone.

Results Obtained.

Similar remarkable results have been reported in feeding pigs from weaning time until they are ready for market. An Oregon test on five small pigs showing a combined weight of 36½ lb. were increased six times their weight in 58 days, to 219 lb. An Oregon farm feeding two lot of hogs, one lot of ten pigs consuming only 1,800 lb. of mixed feed containing dried buttermilk, showed a gain of $21.12 at 16 cents a lb. pork, over the other lot of ten hogs consuming 2,000 lb. of good feed without buttermilk—this gain was 49 per cent. profit on the investment over the feed without buttermilk.

The merchant of to-day is continually keeping track of the articles that sell the best and also the ones that show the best profit. The farmer or feeder of poultry, hogs, and all farm animals, should be equipped to do the same as the merchant, that is, check up the best feeds by testing for results. Often we find the highest priced feed is the cheapest in the long run, when the proper records are kept.

Remember the specialities in all lines of business are the ones that bring the most money both to the seller and purchaser alike, and it seems to me that it is your duty to develop all the high-class specialties and assist by teaching the farmers and feeders the methods best adapted for obtaining the highest results from the goods you are selling. A store selling only staple articles such as sugar, potatoes, flour, and salt will never pay the groceryman any more than the straight grains and mill feed alone will pay sufficient profit to the feed dealer. He must have sufficient variety. Take the new articles and show your trade their value. For a number of years the feed trade had but little to talk about, and were only acting as transfer companies, transferring the grain from one section of the country to another, and what extra money they made was usually made in speculating. To-day you have the most remarkable field for development that has ever been brought out in this country.

You will remember that I mentioned a remarkable test in fattening of milk-fed poultry. It took me two months to induce the company to permit me to make the test. The results with this test showed that by a new system they were able to secure enough more production to pay for all the feed, and $70 per ton besides.

To assist them in presenting this to the public I arranged for 1,000 chicken dinners to be put on at the three leading hotels of Portland. The company fattened 1,600 birds for the occasion, and we advertised the dinners far and wide. The hotels were packed, and as many as 200 people were waiting in line. The endorsement of this idea and of the milk-fed chickens was far beyond my expectations. I am only giving you this as one of the novel ways of introducing your wares to the trade and the general public."

[Portion of an address delivered by Mr. S. T. Edwards, of Chicago, before the Eastern Federation of Feed Merchants, and printed in the *New York Produce Review and American Creamery.*]

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

PRUNING.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

DRAINAGE.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable

quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other material.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

Spraying.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur, nicotine—sulphate or red oil spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

The Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil.

Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Paeonies, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects. The plants mentioned above strongly object to lime.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out early Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

The Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

LIVE STOCK.

HORSES.—The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.
10 do. lime.
1 do. sulphate of iron.

If possible be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.

CATTLE.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Journal of Agriculture, Nov.* 1922, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

PIGS.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

SHEEP.—Late lambing in the wetter districts of the State should end with this month. Late lambs are usually the result of joining the rams as late as March: this should be confined to strong cross-breds and sheep with a predominance of English blood. Lambs dropped in August do well if the district be late or if there be available for them before they are weaned summer grasses and forage. In most places such feed can be grown only by means of irrigation.

In the early northern districts of the State preparation is now being made for shearing. Early shearing is advisable where it is intended to fatten quickly old ewes, early-dropped lambs and two-tooth wethers unsuitable for wool production.

The decision should now be made as to the breed and number of rams required for the coming season. Place orders as soon as possible; breeders can then give satisfaction and allot preference to early applicants. Breed and class should be given most careful consideration. Certain districts and pastures suit one breed or cross better than another. This knowledge can be gained only from the experience of others, or by trial after mature judgment by the sheep-farmer himself.

VINEYARD.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before middle of month, at latest. Conclude pruning and tie down rods. Preventive swabbing with acid iron sulphate solution, to control vine Black Spot, is emphatically urged. This fungus was much in evidence last season; given a showery spring, a grave visitation is a certainty. Neglect of swabbing may spell disaster. A bulletin dealing with black spot and its treatment will be supplied on application. In some districts erinose will necessitate treatment. See article in current issue on Vine Black Spot and Erinose.

CELLAR.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

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Electric motor power totals 900 H.P.

Produce can be placed on conveyors at any point and mechanically carried to any chamber in the building, or conveyed from the chambers direct into the ship's hold.

The Railway Department Goods Sheds are adjacent to and connected with the Cool Stores by direct lines; delay and exposure of produce through shunting in the Spencer-street yards, or cartage, are thus avoided. The Stores are situated in close proximity to the Victoria Dock, where vessels drawing up to 30 feet of water can be berthed; excellent facilities for the efficient and economical treatment and shipment of frozen and perishable products are provided.

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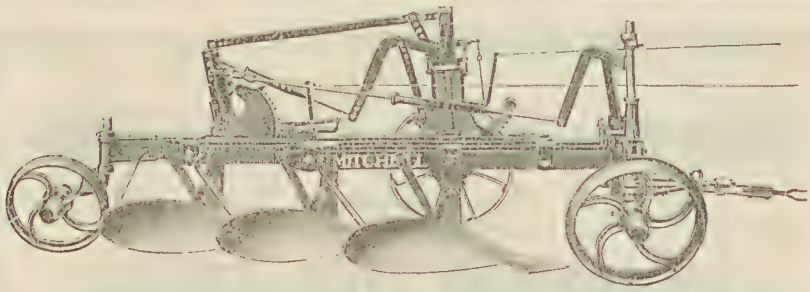

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(1) BULL "VICTORIA TOPNOTE" *ex* DOMINION HYACINTH (374)

Dropped 29th August, 1923

Sire: **Victoria Songboy (359)** by Dominion Domino Dutch Boy (73).

Sire of Dam: **Oak de Kol 2nd Homestead Fobes** (imp. to N.Z. from America) (341 N.Z.F.H.B.).

Dominion Hyacinth's Record for 273 days under Government Herd Test—
11,512 lb. Milk, 479 lb. Butter Fat. Price, 40 guineas f.o.r. Werribee.

For Full Lactation Period—
13,898 lb. Milk, 589 lb. Butter Fat.

(2) Bull Victoria Patch Lad *ex* Victoria Oakdale Lassie (996)

Dropped 24th September, 1923

Sire: **Victoria Jo Patch (345)** by Longbeach Big Patch (515 N.Z.F.H.B.), *ex* Dominion Madrigal (371).

Sire of Dam: **Dominion Oakdale (342)** by Oak de Kol 2nd Homestead Fobes.

Her Dam, Dominion Proud Lassie's Record for 273 days under Government Herd Test—
11,336 lb. Milk, 3·42 Test, 387 lb. Butter Fat.
Price, 32 guineas f.o.r. Werribee.

For Full Lactation Period—
12,216 lb. Milk, 3·51 Test, 428 lb. Butter Fat.

(3) Bull Victoria Woodpatch *ex* Dominion Woodnymph (988)

Dropped November, 1923

Sire: **Victoria Jo Patch (345)** by Longbeach Big Patch (515 N.Z.F.H.B.), *ex* Dominion Madrigal (371).

Sire of Dam: **Woodcrest Jo** (imp. to N.Z. from America) (334 N.Z.F.H.B.).

Dam's Record for 273 days under Government Herd Test—
10,610 lb. Milk, 3·17 Test, 336 lb. Butter Fat.

For Full Lactation Period—
13,240 lb. Milk, 3·31 Test, 439 lb. Butter Fat.

The record of the dam—DOMINION MADRIGAL—of the sires "Victoria Songboy" and "Victoria Jo Patch" for 273 days under Government Herd Test is 11,373 lb. Milk, 3·93 Test, 448 lb. Butter Fat; and for Full Lactation Period 13,485 lb. Milk, 4·17 Test, 563 lb. Butter Fat. "DOMINION MADRIGAL" is a full sister to "DOMINION QUEEN MERCEDES," third cow of all breeds under Government Herd Test 1923, and Winner "Weekly Times" Butter Competition, Melbourne Royal Show 1923, and Champion Melbourne Royal Show 1923.

Price, 32 guineas f.o.r. Werribee.

(4) Bull Victoria Bellringer *ex* Victoria Dutchbelle (990)

Dropped October, 1924

Sire: **Victoria High Patch (537)** by Victoria Jo Patch (345).

Sire of Dam: **Dominion Domino Dutch Boy (73)** by Longbeach Primrose League (698 N.Z.).

Dam's Record for 273 days under Government Herd Test—
8,768 lb. Milk, 314 lb. Butter Fat, 358 lb. Commercial Butter.
Price, 22 guineas f.o.r. Werribee.

(5) Bull Victoria Bridegroom *ex* Victoria Wedding Bell (999)

Dropped 18th September, 1924

Sire: **Burnbank Inka Segia Pietje (402)** by Alderley Segis Beets (imp.) (187).

Sire of Dam: **Victoria Milkman Jo (344)** by Woodcrest Jo (imp.) (344 N.Z.).

Dam's Record for 273 days under Government Herd Test: First Lactation Period—
6,838 lb. Milk, 3·50 Test, 239 lb. Butter Fat.
Price, 15 guineas f.o.r. Werribee.

G. Dam, DOMINION BELLE CORONA'S record for 273 days under Government Test—10,799 lb. Milk, 382 lb. Butter Fat, 436 lb. Commerical Butter. For Full Lactation Period—14,027 lb. Milk, 513 lb. Butter Fat, 585 lb. Commercial Butter.

Inspection of above Bull Calves at the State Research Farm, Werribee, is invited.

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DEPARTMENT OF AGRICULTURE, VICTORIA

Red Poll Dairy Herd

The Department has now completed the orders for calves that were booked ahead of calving when the advertisement was withdrawn; consequently the booking of orders for bull calves from the forthcoming calvings has now been resumed.

BULL CALVES are sold for delivery at a month old at prices based approximately on the actual milk and butter fat record of the dam at the rate of 1s. per lb. of butter *fat* yielded. Thus a calf from a cow with a 400 lb. butter fat record is sold for 20 guineas, one from a 300 lb. butter fat cow for 15 guineas, and so on. Bull Calves *ex* heifers on their first calf are sold for a set price of 10 guineas.

(For Record of Yields of dams see Red Poll Herd Book.)

VICTORIA VOLCANO (322 A.)

Sire: Nicotine (69 A.A.) by Acton Dewstone (imp.) 9524 (4 A.A.).
Dam: Tonga (253 A.) by Honingham Archbishop (imp.) 9702 (48 A.A.).

Tonga's butter fat yields for 6 successive lactation periods are as follow:—1916, 341 lb.; 1917, 398 lb.; 1918, 419 lb.; 1919, 479 lb.; 1920, 428 lb.; 1921, 562 lb.

BELLIGERENT (Imported) 11096 (8 A.A.)

Dam's Record (1st milking) 7144 lb. milk.

Dam's Dam's	,,	14533 lb. milk	...	4	years average	12871 lb. milk.
Sire's Dam's	,,	10370 ,,	...	7	,, ,,	9354 ,,
Sire's D. Dam's	,,	9510 ,,	...	12	,, ,,	8033 ,,
G. Sire's D. Dam's	,,	10215 ,,	...	7	,, ,,	9386 ,,
G.G. Sire's D. Dam's	,,	12565 ,,	...	10	,, ,,	8853 ,,
G.G.G. Sire's D. Dam's	,,	10088 ,,	...	2	,, ,,	9754 ,,

BIT O' 'BACCA (Vol. 3)

Sire: Nicotine (69 A.A.) by Acton Dewstone (imp.) 9524 (4 A.A.).
Dam: Nictitana (311 B.) by Nicotine (69 A.A.).

Nictitana's butter fat records for 6 successive lactation periods are as follow:—1918, 450 lb.; 1919, 396 lb.; 1920, 393 lb.; 1921, 465 lb.; 1922, 524 lb.; 1923, 536 lb.

Inspection of the Herd is Invited.

Visitors will be met at the Station on notifying the Manager, State Research Farm, Werribee.

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There must always be a basic reason when one line is superior to all others! In "Cletrac's" case its tremendous advantages are largely due to its unique method of running on its own tracks. The principal of the War Tanks' self-laying tracks is embodied in the "Cletrac"—**and perfected!** This method reduces the ground pressure to 4½ lb. per sq. inch, and in a special test it was definitely proved that **"Cletrac" has a lighter ground pressure per sq. inch than a man!** Every farmer will realize what that means at fallowing time.

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